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No. 192

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PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

ACADEMY OF SCIENCES PROJECTS DISCUSSED

OW021727 Beijing XINHUA in English 1221 GMT 2 Feb 83

[Text] Beijing, January 2 (XINHUA)--The Chinese Academy of Sciences has chosen 26 research projects, the vice-president of the academy, Professor Yan Dongsheng, said today at the academy's working conference.

Sixteen of the 26 projects are listed in a national research program, including technology to increase output in selected agricultural areas, energy exploitation and energy conservation technology, electronic technology and equipment, new materials and technologies.

Most of the projects will yield fairly large economic or social benefits in three to five years, said Professor Yan Dongsheng, a material scientist in China.

In agriculture, he said, China's biggest plains--the Yellow River-Huaihe River-Haihe River plain, vulnerable to droughts, floods or alkalinization, and the Heilongjiang River-Songhua River-Wusuli River plain, a marshy plain with great farming potential--will be under intensive study.

Scientists will propose plans for state scrutiny on development of the two plains and work out concrete measures for that purpose at selected sites.

Academy scientists will conduct research into a liquified-coal that could be transported through pipes and new power generation facilities. The two technologies have vital importance for north China's Shanxi Province, a major coal producer and a heavy-machinery and chemical industrial center.

If successful, the two technologies will help solve the problem of transporting the province's coal to the rest of the country and power generation at the site of coal shafts in this water-deficient province.

Rural energy resources are one of the major issues for China's agricultural modernization, he said. Chinese scientists will seek ways to alleviate the energy shortage in China's rural areas, he said.

In new materials, the professor said, studies will be made to produce wear, high temperature and erosion-resistant materials and protective coating materials and find new plant varieties containing natural rubber.

Academy scientists will try to develop China's own computer system and applied software for the development of national economy.

In new technologies, he said, focus will be on biological engineering, lasers, super conductivity materials, remote sensing and radiation. A new vaccine for hepatitis B is expected to be produced with genetic engineering technology in three or five years. "This is something that is of major importance to promoting people's health and social welfare," he said.

CSO: 4010/44

LASER TREATMENT, APPLICATION IN AUTOMOBILE PRODUCTION OUTLINED

Changchun QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 11, 82 p 36-39, 56

[Article by Chang Yuxi [1603 3768 3886] of the Jilin Engineering College:
"Laser Treatment and Its Application in Automobile Production"]

[Text] I. Foreword

Laser is a new technology that has developed in the 1960's. During the mid 1960's, laser technology emerged from the laboratory and entered industrial application. Processing jobs including laser punching, cutting and drawing emerged. Later, laser was also used in welding. But this only involved processing materials. It does not cause physical and chemical changes in the material itself.

At the beginning of the 1970's, as the use of large power lasers in industry emerged, laser heat treatment was born.

Laser heat treatment involves the use of a large power laser as a heat source. Laser beams with sufficient power density are used to scan the surface of metals to cause a phase change or melting of the surface of the metal within a very short time, and then the metal is cooled very quickly so that the surface of the metal is hardened, strengthened, or becomes an alloy. The organization, structure and composition of the surface of the metal are changed to improve performance. Laser heat treatment is an advanced and controllable new technology of treating local surfaces.

Laser heat treatment has already been widely used in treating machine parts of various types of cast iron, steels and nonferrous metals. It is greatly emphasized in industry, especially in the automobile industry.

Laser heat treatment has in its course of development gradually formed various types of technological processes of laser hardening and phase changing of surfaces, producing alloys, melting and solidification, microcrystallization, noncrystallization, surface replating, and compound technological processes involving laser and ordinary heat treatment.

This article describes laser heat treatment according to its characteristics, types, facilities and technological parameters and applications.

II. The Characteristics of Laser Heat Treatment

Laser has provided mankind a type of clean and remotely controllable heat source. Its major characteristics generally include the following:

1. Advantages

(1) Because the power density of laser is very high ($>10^2$ watt/square millimeter), its heating rate is very fast (10^4 to 10^9 °C/second), the time of heating is very short (10^{-3} to 10^{-7} seconds). Laser not only conserves energy, its area of heat effect, internal stress and deformation of the parts are all small.

(2) Laser heat treatment relies on quick self-cooling and quenching (cooling speed $>10^3$ °C/seconds). It does not require any cooling medium, there is no smoke, mist, oil, gas. It does not pollute the environment, and it has visibly changed working conditions. The treated spare parts do not oxidize. The treated surface is very clean and it does not require sanding and spraying and acid washing and such cleansing procedures, and the spare parts can be directly assembled.

(3) Treatment can be realized anywhere on any spare part as long as the laser can reach it. Laser heat treatment is especially suited to heat treatment of spare parts that have a complex shape and that are irregular. Different positions on the same spare part can be subjected to different treatment according to requirements.

(4) The facilities are strongly applicable for general purposes, and productive repeatability is good. Operation is simple, and it is convenient to realize mechanization and automation. Production efficiency of laser heat treatment is high, its quality is stable, and it can be included in assembly line production.

(5) After treatment, the spare parts possess a higher surface hardness (15 to 20 percent higher than that produced by ordinary heat treatment) and wearability and anti-corrosion are superior to those subjected to ordinary heat treatment. When used together with ordinary heat treatment for "compound heat treatment," the useful life of spare parts can be greatly prolonged.

2. Shortcomings

(1) Laser heat treatment requires the power of the laser to be at least over several hundred watts, generally in the 1,000-watt class. High power lasers are expensive and large, and these facts affect their application to a definite degree.

(2) The loss of power in the course of energy conversion is greater. The electro-photo conversion efficiency is only 15 percent, and the total efficiency is only 7 to 8 percent. To increase the absorption of laser by metal, the surface to be treated must first be coated. This increases production procedure.

(3) The layer hardened by laser at present is still relatively thin, generally 0.3 to 0.5 millimeters with a maximum reaching 2 millimeters (at 5 kilowatts of power), and at the moment lasers cannot be used for treating heavy load spare parts.

(4) Laser heat treatment is unsuitable for treating whole bodies and large areas. When treating parts with a thin wall less than 5 millimeters thick, the problem of deformation should also be noted.

As science and technology develops and as research continues to deepen, the above problems will gradually be solved, and laser heat treatment technology will become more perfect.

III. The Types of Laser Heat Treatment

Up to the present, there are already many types of laser heat treatment. Their principles and purposes are all different:

1. Surface Hardening and Phase Changing By Laser

This involves the use of laser to heat the surface of a metal to a temperature above the phase change temperature (but lower than the melting point) and relies upon the quick heat scattering of the metal itself to realize self-cooling and quick quenching.

2. Producing Alloy Surfaces With Laser

Producing alloy surfaces with laser involves the use of a laser beam to heat the surface of cast iron or steel containing metallic elements to a temperature above the melting point so that the alloy elements quickly dissolve and the steel and iron surface becomes an alloy.

3. Surface Melting and Solidification by Laser Treatment

This involves the use of a laser beam to heat the surface layer of a metal to a temperature above the melting point to melt it and then to quickly cool and solidify it so that the surface organization changes and the composition becomes even. This kind of treatment requires a scanning laser beam with a good focusing property. The laser power density must be large (10^4 to 10^7 watts/square centimeters), the specific energy density must be small (1 to 10^2 joules/square centimeters), cooling must be fast (10^4 to 10^8 °k/second), the melting efficiency must be high (almost 100 percent), and an absorptive coat is not needed. The depth of the treated layer is generally 4 to 1.0 millimeters.

4. Surface Microcrystallization by Laser Treatment

This involves the use of characteristics particular to a focusing laser beam which has a high power density, a short time of action, and which produces a heat effect limited to the thin surface layer (1 to 10 micrometers) to melt the thin layer within a very short time, to overheat liquid metal and to let

the metal release heat to the solid phase basic metal very quickly. Because the temperature gradient between the liquid and solid phases is very large, the entire liquid metal can quickly cool down and solidify. Because of extreme cooling, a very fine organization is formed as a result.

The microcrystallization treatment described above is an effective way to prevent partial precipitation. It improves the evenness of chemical composition and thus improves the mechanical properties (such as fatigue resistance, breaking resistance, wearability) and the chemical properties (anti-corrosion).

5. Surface Noncrystallization by Laser Treatment (also called "Laser Glazing")

The evenness of chemical composition of noncrystalline metallic materials is very limited. The noncrystalline state of metallic materials provides a very high extendibility, a very high yielding strength and hardness, and good toughness so that the materials are tolerant to wear and are anti-corrosive. When performing surface glazing by laser with a cooling rate greater than 10^6 °C/second on alloys with a co-crystalline composition, the surface of the alloy manifests a noncrystalline state.

6. Surface Replating by Laser

The principle of surface replating by laser is similar to that for welding. A pulverized material is spread on top of the surface of an alloy, then a high power laser is used to heat the surface so that the covering material is completely melted. At the same time, the surface of the metallic base also melts. After the laser beam is removed, the melted surface layer is quickly solidified so that the covering layer and the base are joined together.

7. Compound Heat Treatment By Laser

This involves subjecting a spare part whose surface has already been treated in a certain way to laser heat treatment. Or, spare parts which have already been subjected to a certain kind of ordinary heat treatment are treated again by laser heat treatment.

IV. Facilities and Technical Parameters for Laser Heat Treatment

High power industrial lasers mainly include CO_2 lasers and YAG (yittrium-aluminum-garnet) lasers. CO_2 lasers include the longitudinal direct current discharge type, the longitudinal high speed flow type and the high power lateral flow type. The pulsed CO_2 lasers are also worth noting. Only using these types of lasers can we carry out heat treatment of easily deformed spare parts and experimental research in impact hardening.

Facilities used especially for laser heat treatment include the laser and the following: light guide system--to guide the laser beam towards the surface to be treated; work bench--mainly for maneuvering the surface of the treated object (movement in the X, Y, Z directions sometimes the spare parts have to be rotated); control system--automatic control of surface temperature, the power of the laser and the work bench.

The major technical parameters affecting laser heat treatment include: the power of the laser, the dimension and shape of the light spot, scanning speed and the surface condition of the spare part. The laws of effect of the three previous parameters are as follows: When the power is large, the light spot is small and the speed of scanning is fast, the surface hardness is high, the hardening layer is deep. Conversely, when the power is small, the light spot is large, the scanning speed is slow; although the hardening layer is deep, the surface hardness is low. The surface condition of the metal will affect the absorption of the laser. Therefore, surface treatment should involve appropriate coating.

V. The Application of Laser Heat Treatment in Automobile Production

Foreign and domestic researchers have conducted experimental research in laser heat treatment of many types of metallic materials and automobile spare parts.

At the beginning of the 1970's, General Motors Corporation of the United States first used laser heat treatment in the mass production of the casing of the power steering unit for automobiles (the material was malleable cast iron). The technical and economic results of laser heat treatment of this component were very good. The wearability was improved nearly 10 times. The cost of hardening was less than that of high frequency or nitrogenation treatment by 1/5, and it greatly conserved energy.

The power department at General Motors Corporation also used laser heat treatment to treat the cylinder casing of the internal combustion engine of automobiles. The heat load of that engine is very high. Serious abrasion and wear occur at the gas intake area. Technical processes of nitrogenation and inductive heating to quench the surface and flame surface quenching were tied but they did not solve the problem. Later, laser heat treatment was used and tested for 3 years on more than 40 engines. The results were proven to be good. The cylinder can be continuously used for 40,000 hours. This technical process has been standardized. This process can be learned by the automobile industry.

According to recent reports, the Fiat Company of Italy is using the HPL-10 laser produced by the AVCO Company of the United States to treat the interior wall of the cylinder of automobile engines. This has eliminated the cylinder casing, reduced weight, and reduced fuel consumption. Laser heat treatment led to a renovation in structural design.

In recent years, West Germany, Japan, Britain, and the Soviet Union are also developing research in laser heat treatment of automobile spare parts, and a lot of successful experience has been realized in treating many spare parts including the cylinder, the piston ring, the gas valve, the differential case.

Domestically, some units have used this new technical process to treat the cylinder, piston ring, guardplate of the grinder, positioning key of the automobile engine, and some spare parts of automobiles with internal combustion engines.

The cylinder of domestically manufactured automobile engines has a very short actual useful life. The average useful life of the 6120 high phosphorus cast iron cylinder is only 150,000 kilometers (it is 300,000 to 400,000 kilometers abroad). In recent years, a boron added cast iron cylinder casing has been successfully developed. But the average life is only 5,000 hours (7,000 to 8,000 hours abroad). Therefore, finding a way to improve the useful life of the cylinder has a very important meaning in industrial and agricultural production. There is no doubt about this.

The cylinder casing is subjected to heat loads, mechanical loads and chemical corrosion during use. Its main cause of loss of efficacy is wear. Therefore, in order to improve the useful life of the cylinder casing, we must begin by improving its wearability.

The area hardened by laser heat treatment has a high hardness (over RC60) and it is highly anti-corrosive. It forms a wear resistant hard framework to improve the wearability of the cylinder casing. The center of the hardened area still retains the function of graphite to reduce friction and for lubrication.

The experiment in laser heat treatment of the cylinder casing used a 500-watt isolated and electrically excited CO_2 laser (folded V shape). The total length of electrical discharge is 12 meters. It is made from quartz glass. The output window is a 4-millimeters GaAs. The discharge tube is filled with a proportionally mixed gas of He-NCO_2 and the output is multiple mode. The light guide and the focusing system are shown in figure 1.

Figure 1 Simplified diagram of the light guide and the focusing system

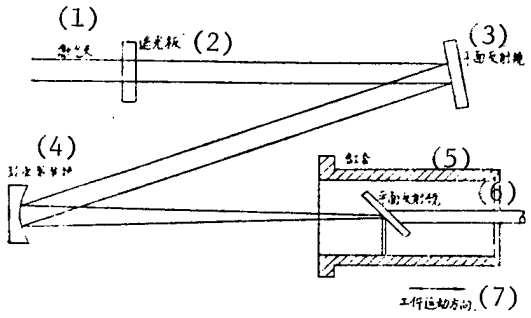

图 1 导光及聚焦系统简图

Key:

1. Laser beam
2. Light shield
3. Plane reflecting mirror
4. Spherical focusing mirror
5. Cylinder casing
6. Plane reflecting mirror
7. Direction of movement of object

Figure 2 Comparison of wearability before and after laser heat treatment of different materials

1--untreated; 2--laser treated

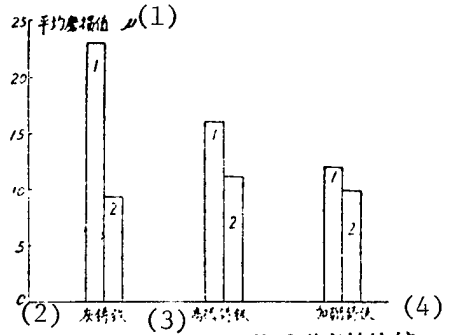

图 2 不同材料激光热处理前后耐磨性比较

1—未处理; 2—激光处理

Key:

1. Average value of wearability
2. Grey cast iron
3. High phosphorus cast iron
4. Boron added cast iron

The cylinder casing can be maneuvered in a composite way along a straight line and in rotation to obtain a spiral hardened area.

The results of laser heat treatment under the following technical parameters are shown in Figure 2: the power of the laser was 500W, the diameter of the light spot was 2 millimeters, the scanning speed was 13 to 23 millimeters/second. Cylinder casings of three different types of materials pretreated by phosphorization were subjected to laser heat treatment. The wearability of high phosphorus and boron added cast iron cylinder casings showed a relatively small improvement while the wearability of the ordinary cast iron cylinder casing improved 50 to 60 percent. Therefore, in surface heat treatment by laser, the selection of appropriate materials is very important.

Simulated experiments proved that the wearability of the cast iron cylinder casing hardened by laser showed an improvement of 10 to 30 percent over that of the boron cast iron cylinder casing hardened by laser, and an improvement of 60 to 100 percent over that of high phosphorus cast iron cylinder casing not laser hardened. This has approached the level of the best domestic vanadium titanium cast iron cylinder casing and niobium cast iron cylinder casing at present. According to experimental results of 12 hours of continuous high speed wear, it is estimated that the useful life of this type of laser hardened cast iron cylinder casing can reach about 8,000 hours.

Conclusion

Laser heat treatment is a product of a combination of new laser technology and the heat treatment technology that has a long history. This requires heat treatment workers to become familiar with a grasp related laser technology in order to carry out research work.

The characteristic of quick heating and sudden cooling in laser heat treatment has brought about many new subjects in the science of metals. Many abnormal phenomena that are difficult to explain by past viewpoints have emerged. Therefore, we should strengthen the study in basic theory of laser heat treatment in a big way--especially the study of the theory of phase change in high speed heating so that the rapid development of laser heat treatment technology can be pushed forward in our nation.

Because the facilities for laser heat treatment are complex, the size is large, the prices are high, when considering the object of application of laser heat treatment, we should adhere to the following principles:

1. We should use laser heat treatment to solve the problem of spare parts that cannot be treated by ordinary heat treatment or that are difficult to treat ordinary heat treatment;

2. We should use laser heat treatment for spare parts that can be treated by ordinary heat treatment but the use of laser heat treatment could visibly improve performance or greatly increase the labor production rate;

3. We should use laser heat treatment for spare parts that have a strict requirement for deformation and that also have a very complex shape, and in situations where laser heat treatment has to be used;

4. At present, we should first use laser heat treatment to solve the problems of several types of auxiliary friction disks, especially cylinder casing--piston ring auxiliary friction disks that are used in large quantities and that have a relatively low useful life;

5. We should pay attention to economic results. If the performance is good but the economic results are poor, the process cannot compete with modern technical processes and it will not realize the goal of widespread application.

(Thirty references are omitted)

9296
CSO: 4008/48

JZ200/600 CROSSBAR AUTOMATIC TELEPHONE EXCHANGE DESCRIBED

Beijing TIEDAO TONGXIN XINHAO [RAILWAY COMMUNICATION SIGNAL] in Chinese No 11, 1982 pp 1-3

[Text] After the JTZ Model 200/400-line crossbar automatic telephone exchange was placed into extensive use in various areas, design, manufacturing, and operating units presented many views, particularly reflecting the various problems. Repeaters are small in number; long distance automatic connection "paths" and the outgoing trunks of two 200-line units are incompatible; a connection from a subscriber's telephone to the repeater on the toll board causes each call to occupy a market; and the performance of the toll board's repeater is poor.

The JZ200/600 exchange (called the ZHJ in the design and trial production stage) is a regional automatic exchange equipment designed in coordination with the specific conditions of the country's railway telephone communications network using the JTZ exchange as a base. It can meet the telephone communication requirements of single-office regions such as railway regional stations and intermediate stations.

The JZ200/600 crossbar automatic exchange uses a 200 line basic unit which can be expanded in capacity to 400 or 600 lines. The three-digit numbering system has been adopted for regional subscriber numbering.

Directly connected with the CA-I or CA-II automatic toll link, the point-to-point automatic repeater may be connected to eight "paths" bearing index numbers 81-88, and the number of the repeaters on each "path" may be jumpered according to need. If the home switch is connected to the automatic toll switch, the trunk toll automatic index number would be "9" and the local toll automatic index number would be "8." At this time, the remaining point-to-point toll return repeater would be converted to index number "01-06." Toll boards would be directly joined with such manual toll switchboards as the JT-73 or JT-3A. Special service repeaters 141 and 161 can be connected to the toll board or to a specially established records information [position]. Special service repeater 151 has the capability of automatically ringing back in the direction of the caller. After the caller has dialed number "151," heard the ringback, and put down the transmitter-receiver, the TF 151 repeater will send ringing current in the direction of the calling subscriber's telephone. On hearing his telephone ring, the calling subscriber picks up the hand set again and the ringing stops. After the calling subscriber replaces the handset, the

relay returns to its original state. This "self-ringing" capability may be used by outside plant workers for test ringing during telephone repair, and may also be used for calling and communication between two extensions. If the calling subscriber still has not picked up the handset after 10 seconds of ringing, the TF151 repeater is automatically released and returns to its original state.

The city telephone offices outgoing trump index number "00" may be connected to any type of city telephone office. The city telephone office is connected to an incoming subscriber circuit or is connected by a manual switchboard. Inasmuch as the JTZ Crossbar Automatic Telephone Exchange is already familiar to the specialists in technical railway telephone operation, the following introduces only the principal characteristics of the JZ200/600 Exchange and the differences between it and the JTZ Exchange.

I. Performance Features

1. There are actual subscribers and there are toll subscribers.

Connecting JTZ Exchange toll repeaters and special service repeaters to the subscriber circuits occupies subscriber numbers and causes the 200-line exchange to have only 178 subscribers.

On the JZ200/600 Exchange, the various incoming trunk and outgoing trunk equipment is connected by the vertical unit of the CS grade connector without further occupying subscriber numbers, so that subscribers may be connected to the limit of the line capacity. At the same time, new toll subscriber lines amounting to 4 percent of capacity may be used to connect toll subscriber telephones on lines with loop resistance of less than 3,000 ohms (including the resistance of the subscriber telephone).

2. Capacity expandable to 600 lines.

JTZ Exchange subscriber numbering is according to the three-digit numbering plan, 2XX-5XX when it is a 400-line exchange, so that its capacity can only be expanded from 200 to 400 lines.

In the "TBnz-78 Standard," "7" in regional exchanges is prescribed as the subscriber lead number. When the JZ200/600 Exchange uses the same three-digit numbering plan, it can use subscriber numbers 2XX-7XX, and capacity can reach 600 lines.

3. Each region's subscribers have only one number.

The special operation telephone leading digit of the JTZ Exchange is "1" and its special service repeater is connected outwardly using subscriber circuits. This makes subscriber 2XX also 1XX at the same time, causing one subscriber to have two numbers. When a subscriber dials an incorrect number, an incorrect call is produced. For example, if a subscriber of a JTZ-400 Exchange erroneously dials "171," and if the calling subscriber is in the first 200 lines, he would be incorrectly connected to subscriber 271; if the calling subscriber is in the second 200 lines, he would be incorrectly connected to subscriber 471.

When the special service repeater of the JZ200/600 Exchange is connected outwardly by the CX grade connect, each area subscriber has only one number, so that the erroneous call problem will not exist.

4. There are many automatic toll connection "paths"; loop lines are adequate.

The JZ 200/600 Exchange is equipped with 8 point-to-point automatic toll loop line "paths." When there are 200 lines, they each have 15 outgoing automatic toll repeaters and incoming repeaters, twice the automatic toll connecting "paths" or twice the number of repeaters on the JTZ Exchange, which is adequate to meet the requirements of various conditions. When the capacity is increased to 400 or 600 lines, the automatic toll repeater, after graded multiple reconnecting, may be employed compatibly among 200 different lines, reducing the call loss rate.

When automatic incoming toll repeaters of the JTZ Exchange are firmly connected to incoming senders, each incoming repeater may hold only one sender. The automatic incoming toll repeaters of the JZ200/600, on the other hand, have 15:30 interconnecting circuits with the incoming senders, and each automatic incoming toll repeater may select two incoming senders, raising the connection rate of the automatic incoming toll repeaters.

5. Automatic outgoing toll trunk circuits are simple and reliable.

The JTZ Exchange's automatic outgoing toll trunk circuits are equipped with six relays: the CM, CZ, CH, CC, CS, and CP.

In the JZ200/600 Exchange, the newly designed automatic outgoing toll trunk circuits have only three relays: the CM, CZ, and CH, which directly retransmit the calling subscriber's dial pulses. The equipment is simple and its action reliable. The automatic outgoing toll repeater uses the idle (line) indicator voltage to tape directly the C lead from the CZ-I automatic toll connector. Should a trouble block the outgoing frame of the connector, it would be equivalent to direct blocking of the outgoing repeater. Under the same conditions, the JTZ Exchange, on the other hand, because its idle line indicator voltage from the automatic outgoing toll repeater to the marker is provided only when the outgoing trunk is idle, after the caller has dialed out and made a connection to an outgoing trunk, because the outgoing frame of the connector has already been closed, cannot hold the outgoing frame of the connector. The CS relay is activated and releases all grades of periodic lines. The caller hears a busy tone, and this produces a meaningless call loss.

6. The CS grade connector uses the JX_3 model 10x30x3 connector.

The CS grade connector of the JTZ Exchange uses the JX_2 model 10x20x3 connector, with each vertical unit having 20 groups of moving-spring-type outgoing lines.

The CX grade connector of the JZ200/600 Exchange uses the JX_3 model 10x30x3 connector, with each vertical unit having 30 groups of moving-spring-type outgoing lines, expanding the number of CS grade outgoing lines. Besides

permitting the supply of adequate outgoing trunk loops, rational selection of a graded multiple type for the CX grade outgoing lines should of course require the use of only two intergroup crossconnect frames when expanding to 600-line capacity. If compared with the JTZ, it corresponds to saving an intergroup crossconnect frame in the case of the 600-line capacity.

7. Performance of toll repeaters is excellent.

After the subscriber line has been connected to the repeater of the JTZ exchange, the marker must make a call connection each time the toll operator calls an area subscriber.

Once the toll repeater of the JZ200/600 Exchange is connected by the CX grade, the marker is not required to make another call connection each time the toll operator calls a regional subscriber. This reduces the time to make a connection on toll channels and lightens the busy-hour load of the marker. Newly designed toll boards have a relatively excellent service capability: signal displays are in accordance with toll board requirements, being able to differentiate between toll and regional busy hours. When the regional subscriber is busy, the supervisory lamp on the toll board flashes. It is possible to plug in and talk, and there is an accompanying supervisory tone. Should the subscriber be in the process of making a manual toll call, it would not be possible to plug in; the supervisory lamp on the toll board would flash; and the operator would hear a busy tone.

8. It is equipped with special service 151 self-ringing repeaters.

The JZ200/600 Exchange includes a newly designed self-ringing repeater, so that the maintenance and repair areas may use it to the test ringing operations of subscriber telephone instruments themselves, with no further need to coordinate with on-duty personnel in the automatic office.

9. It is equipped with an excellent three-level fuse alarm signal.

The JTZ Exchange has only circuit fuse alarms. The JZ200/600 Exchange is equipped with three levels of fuse alarms such as: circuit, equipment rack, and array. The newly selected fuse with contact point alarm has such advantages as direct visibility of alarm contact points, each of adjustment, and alarm reliability. To insure that alarm circuits are always in the normal state, the fuse alarm circuits of all equipment racks and arrays are equipped with alarm test keys.

10. It uses number tubes for direct display of subscriber numbers linked to the market.

The JTZ Exchange's link to the subscriber is displayed by using dispersed hundreds, tens, and units lamps, by which the reading of numbers is very inconvenient.

The JZ200/600 Exchange uses a number tube to display the number of the subscriber linked to the market, making it convenient to read the numbers, and

presenting an attractive appearance. On the basis of feedback from maintenance personnel, this substantially helps to remove obstacles in maintenance and repair work.

II. Improvements in the Connectors and Relays

To raise the operational reliability of the JZ200/600 Exchange, the Shenyang Signal Plant made the following improvements to the principal components of the crossbar exchange--connectors and relays:

1. To solve the problem of wire breaks resulting from protruding wires, the method of assembling coil racks and wire guide plates was changed from riveting to directly pressing into a single unit. Although this structure was not convenient for production, it provided insurance against protruding wire ends resulting from the movement of loose coil wire guide plates.

2. Change the HC activation card inthe three-digit connector so that movement in the HC location would not cause motion in the HA or HB activation cards, nor would motion in the Ha or HB activation cards cause motion in the HC activation card, preventing repeat telephone connections.

3. Connector static separator boards changed from phenolic cardboards to expoxy fiberglass boards. The latter, with greater mechanical strength than the former, does not absorb moisture and does not become deformed so easily, and will not cause false connections because of crosses in crosspoints resulting from static separator boards changing shape.

III. Improvement of Equipment Rack Structure

1. Unitized equipment rack.

The JTZ Exchange is divided into three types of equipment racks--left, center and right, while the JZ Exchange is equipped with one type of unitized equipment rack, with the array of alarm lamps changed to a hanging design which may be disassembled, making it convenient to install and arrange and adaptable to various types of equipment rooms.

2. Dismountable double doors for the rear doors of equipment racks adopted.

In the past, almost all models of crossbar exchanges used lift-catch type doors which were extremely inconvenient to use on site. Now the newly designed dismountable double-door construction permits both doors to be opened 120 degrees. When necessary, the rear door may also be dismounted, so that one person may then open or dismount the upper layer of doors, which is both safe and convenient.

IV. Structure and Arrangement of Complete Equipment

The outer dimensions of the J 200/600 exchange are 2,700 x 650 x 360 millimeters. The complet series consists of a total of eight standard types of equipment racks: AX_1, AX_2, BX, SL, RZ, BZ, ZJ_1 and ZJ_{20}, each weighing an average of 250 kilograms. See the chart for the number and types of equipment racks for exchanges of different capacities.

At the top of either end of each series [set or system] of equipment racks, an array of flexible hanging alarms is installed. The contents of the colored lamps are (from top to bottom): red lamp for a blown fuse, blue lamp for a critical technical alarm, green lamp for an ordinary technical alarm, and white lamp (temporarily unassigned). The various equipment racks of an exchange are arranged according to capacity (see Figures 1-3), using fixed screw bolts to connect the racks. To prevent vibration there are mounting holes in the crossbeam at the top of the back of each rack to bolt it to the wall, and there are mounting holes in the base to bolt it to the floor ducts.

Type \ Capacity / Number		200	400	600	Remarks
AX_1	Rack	1	2	3	
AX_2	"	1	2	3	
BX	"	1	2	3	
SL	"	1	2	3	
RZ	"	1	2	3	
BZ	"	1	2	3	
ZJ_1	"		1	1	For 400 lines
ZJ_2	"			1	For 600 lines
Total		6	13	20	

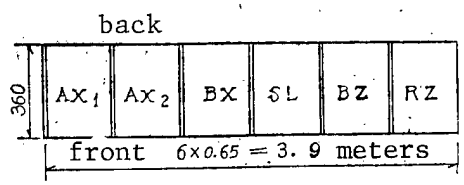

Figure 1. 200-Line Arrangement

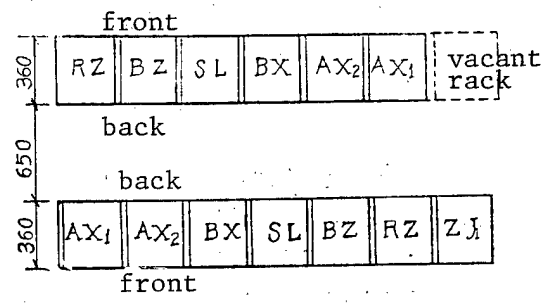

Figure 2. 400-Line Arrangement

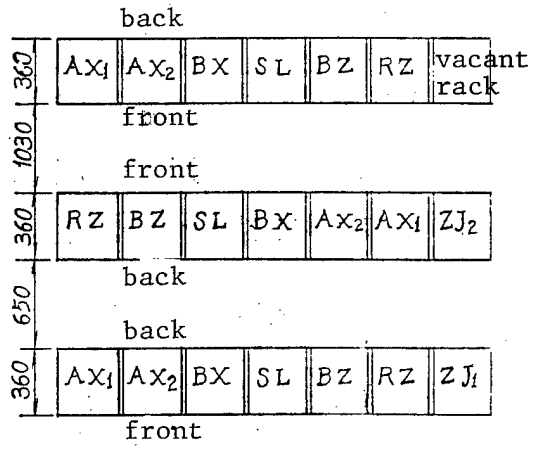

Figure 3. 600-Line Arrangement

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DEVELOPMENT OF ORE PROSPECTING ENGINEERING DESCRIBED

Beijing TANKUANG GONGCHENG [PROSPECTING ENGINEERING] in Chinese No 5, 1982 pp 5, 6

[Article by Yang Chunfa [2799 2504 4099], Office of Geology, Ministry of the Metallurgical Industry: "A Survey of the Development of Ore-Geology Prospecting Engineering"]

[Text] In the 32 years since the state was founded, under the leadership of the CPC, geological prospecting for metal ores has been brought into being, expanded to a large scale and developed rapidly; as this activity has developed, prospecting engineering has progressed as well.

In the last 32 years a total of 33.40 million meters of prospecting drilling has been completed (the maximum level of 2.22 million meters was achieved in 1978; since 1966 the monthly drill productivity has been increased by more than 5 times over the period immediately after Liberation. The total amount of pit prospecting has been more than 3.6 million meters, total trench prospecting has exceeded 42 million cubic meters, and shallow shafts have accounted for 1.7 million meters; there has been a great increase in excavating efficiency.

Current holdings total more than 2,600 drills or sets, with more than 1,800 exploratory drilling personnel. There are more than 3,000 personnel engaged in pit, trench and shaft prospecting, and more than 700 technical personnel, located in every province, municipality and autonomous region in the country with the exception of Tibet and Taiwan.

A prospecting engineering curriculum has been established at the Central South Mining and Metallurgical Academy and the Changchun School of Metal Ore Geology, and large numbers of specialized technical personnel have been trained for prospecting, making a great contribution to prospecting, research, and educational work.

A prospecting technology research laboratory has been established at the Institute of Geology of the Ministry of Metallurgy, and a specialized prospecting technology research institute has been established in the No 1 Geological Ore Prospecting Company; these organizations have added to the research contingent, have pursued multifaceted scientific research and have achieved gratifying results.

Rather large machinery plants, repair plants and machine shops have been set up to manufacture and repair the specialized machinery, equipment, gear, drilling tools and industrial-diamond bits and reaming device needed by the prospecting engineering field.

Prospecting drilling with industrial-diamond bits is being energetically expanded and developed in an attempt to revamp the backward prospecting engineering industry in the near future, modernize it, and catch up with the world state of the art.

Below we briefly describe the development of geological prospecting engineering for the metallurgical industry.

Immediately after Liberation, during the period of recovery of the national economy, there were 10-odd older workers in the exploratory drilling field in the northeast. Under the guidance of the Nonferrous Metallurgy Industry Management Office, they collected together old and decrepit prospecting drilling equipment abandoned by the enemy from wherever they could find it, patched together 10 vertical-axis hand-held drills, and carried out prospecting drilling in several producing mines such as Jiapigou and Shijuzi. At the same time, they held exploratory drilling technology training classes at Shijuzi, Jiapigou and Changchun. Using a combination of training classes and individual apprenticeship to older master drillers, they trained more than 500 personnel in exploratory drilling, preparing the manpower for future increases in the drilling equipment inventory. As a result, an engineering cadre in prospecting drilling gradually came into being. At that time, production standards were low and the average monthly output per drill unit was only about 50 meters.

In 1952-1953, advanced training classes in prospecting drilling were held, technical personnel were trained for prospecting drilling, and a technical and industrial school of prospecting drilling was established. In its initial period it trained 3,000 technical personnel in the field, preparing the technical contingent for nationwide expansion of geological ore prospecting. In 1957 a maximum figure of 627 rigs were in operation. At the time, the main devices in use were vertical-axis hand-held drills for use with iron shot, imported from the Soviet Union; the single-charge iron shot method was in widespread use. In the First 5-Year Plan period (1953-1957) the average monthly output per rig was 104 meters, more than twice the figure immediately after Liberation. The main problems in prospecting drilling technology were that the iron shot could not be used to drill through hard rock, and that the efficiency was very low. In order to increase drilling speed, in 1956 the personnel of the Anshan Branch Geological Office conducted experimental studies of the use of steel shot as a replacement for iron shot, successfully dealing with the difficulty of drilling through hard rock. The speed of drilling through hard rock using steel shot was twice that achieved with iron shot, and steel shot consumption was less than that of iron shot. Thus replacement of iron shot by steel shot enabled exploratory drilling technology to take a great forward step.

Starting in 1958, the use of steel shot drilling was vigorously expanded, and the method of a single charge of steel shot and the "two large and one fast" (large drill pressure, large amounts of flush water, fast rotary speed) were used (as alternatives to the iron shot drilling method), resulting in a great increase in efficiency. During the Second 5-Year Plan period (1958-1962) the maximum number of drilling units in operation was 744 and the average monthly output for the 5-Year Plan was 236 meters, more than double the figure for the First 5-Year Plan. Because in steel-shot drilling the drill pressure and rotary speed were increased, the obsolete hand-held units could not meet requirements: the machines vibrated violently during drilling, the machine components heated up and began to smoke, and the feed handle and crossbar would sometimes swing back and injure workmen. The drilling personnel repeatedly suggested that "the drilling units should be compact and light, their construction should be tough and simple, their capabilities should be advanced and practical, and their operation should be easy and safe." This contradiction arose because the abrasive used in the new steel-shot method was not suited to the old-fashioned machinery. In order to resolve the conflict, the drill operators themselves modified the machines, replacing the feed handle with a hand wheel, and substituting for the crossbar a hoist cable used to raise the drilling tool from the hole mortar to decrease drilling pressure, thus solving the problem of injury to workers from the feed handle and crossbar. Between 1959 and 1963 the Beijing Research Institute of Ore Geology, the Central South Geological Ore Prospecting Company, the Beijing Ore Geology Machinery Plant and the relevant geological prospecting companies and brigades cooperated viborously. Because geological ore prospecting generally involved slant holes in mountainous regions, they assimilated the masses' experience in modifying the hand-held drills and developed and tested the Beijing model rotor-type drill. This unit had a rotor to drive the drill bit and pipe, a hoisting cable to adjust the drilling pressure, and a long-travel non-reversing feed lever. These modifications were suited to steel shot drilling and the device was easy to transport and set up in mountainous terrain and to use for drilling slant holes. The rotor-type drill was put into widespread use so that the capabilities of steel-shot drilling could be fully utilized. During the Third 5-Year Plan period (1966-1970) the maximum number of drills in operation was 675, with an average monthly output of 327 meters.

Although steel-shot drilling was more efficient than iron-shot drilling, the technical systems used for it were still identical with those used for iron-shot drilling and thus were obsolete. When steel shot went into widespread use there had been no basic change in the drilling technology. Because in steel-shot drilling a large amount of loose shot was rolling and colliding at the bottom of the drillhole, it broke the walls of the hole and ground away the core, resulting in excessive drillhole curvature and poor core quality; even if the drillhole diameter was increased to 110 mm, the core recovery rate and core integrity still were not adequate, and the problems of core contamination and selective

abrasion persisted. Accordingly the poor engineering quality of steel-shot drilling was a serious problem. Especially in mining districts of complex geological structure, extensively fractured strata and ore bodies, subject to selective abrasion, the engineering quality resulting from the use of steel-shot drilling was unreliable.

In order to modernize obsolete prospecting drilling technology, the Beijing Institute of Ore Geology and various relevant units (the Beijing City Dongcheng District Industrial Diamond Plant, the Beijing City Institute of Powder Metallurgy, the Institute of Physics of the Chinese Academy of Sciences, the Zengzhou Institute of Abrasive Materials and Grinding of the First Ministry of Machine-Building, the Geological Prospecting Brigade of the Capital Iron and Steel Company, the Central South Geological Ore Prospecting Company, the mining office of the Hunan Tin Mines and the like) cooperated, starting in late 1969, in the development and testing of drill bits using industrial diamonds. Following 5 years' research and experimentation of 1 year's production testing, they were basically successful. The use of industrial-diamond bits to drill through medium-hard and hard rock gave higher rates of advance and better engineering quality and was thus far superior to steel-shot drilling.

Starting in 1975, the old drilling machines were modified and the old equipment was used to expand industrial-diamond drilling from individual locations to wide areas. By 1981 the total amount of drilling had reached 855,000 meters. In 1981, 91 drills with industrial-diamond bits were in operation, accounting for a total of 15.3 percent of all drills in use; the monthly drilling output was 329 meters, 41 meters greater than with steel shot, and unit cost was 90.11 yuan, 18 yuan cheaper than with steel-shot drilling.

Several years' production experience indicates that even when matched sets of drilling equipment are not available and the operators are not fully trained, the results obtained with industrial-diamond bits are better than those obtained with steel shot, not only producing a higher production efficiency and better engineering quality, with a wider range of applications and smaller consumption of material, but greatly improving the working conditions for drill operators. This makes it apparent that drilling with industrial-diamond bits has great prospects.

While putting drill bits with industrial diamonds into widespread use, many relevant factories, institutes, academies, schools and geological prospecting companies and brigades have cooperated to expand and improve industrial-diamond drilling technology, achieving excellent results. For example, they have improved the old rotor-type and vertical-axle drills, have used old equipment to institute the more extensive use of industrial-diamond bits, and have established drill bit factories and machine shops for the industrial-diamond bits, in order to provide adequate sufficient industrial-diamond drill bits and hole expanders; they have increased the strength of industrial diamonds and their rock-drilling capabilities, greatly increasing their life and rates of advance; they

have developed relatively rational new graduated drill bit series and have designed a variety of double-pipe and cable type coring units which are suited to the needs of drilling with industrial-diamond bits; and they have successfully developed rock drills, including a 100-meter mine-gallery diamond drill and the Beijing model rotor-type 1500-meter diamond drill, a high-pressure variable-rate flush water pump and high-frequency percussive-rotary drills, all with excellent capabilities; they have developed photosensitive deviation detectors, 5-function well testers, and small-diameter compass-type and fixed-plate deviation detectors, and have solved the problem of deviation detectors in nonmagnetic mining areas; they have successfully studied and tested the use of emulsifiers and other lubricants as drillhold flushing fluids, have instituted high-speed drilling with industrial-diamond inlaid bits, and have achieved excellent results in research on low-solid-phase muds, foamed muds, bitumen muds, solid-free muds, super early-strength fast-setting cements and chemical plugs and protective walls. All of this work has had a major effect in developing drilling with industrial-diamond bits. But in terms of overall matching and modernization of technology we still fall far short, and we must conduct large amounts of technical research. We must further study the improvement of the rock-drilling capabilities of various types of abrasives and drills, placing the primary emphasis on industrial-diamond drills, but also dealing with hard-alloy and other superhard abrasive drills and percussive-rotary drills, so as to select the best alternatives and carry on high-efficiency drilling in all types of rock. We must study and manufacture advanced diamond bits, equipment, accessories and specialized tools in a full range of varieties and specifications, achieving comprehensive series status and matching of sets. We must investigate ways to improve ordinary and special drilling processes and techniques and raise rule-of-thumb practices to a theoretically-based level, so that drilling processes, techniques and methods will be continuously enriched and improved. To summarize, we must provide complete sets of mutually compatible new diamond-drill equipment, continuously improve it, replace steel-shot drilling in the near term and achieve the same performance as in drilling with natural diamonds in the long term.

The Third Plenum of the 11th Party Central Committee decided to shift the focus of all party work to the socialist modernization. This is a great change of course which will make our country's socialist production capabilities develop rapidly and will result in rapid achievement of the four modernizations. Modernization of prospecting engineering first of all requires energetic research work in prospecting technology, and organization of the relevant academies, institutes, plants, geological prospecting companies and brigades for cooperation and division of labor in close coordination. We must sum up our experience, utilize our strong points, learn from advanced domestic and foreign experience and put it to work for us. We must continue to self-reliantly solve the problems of expanding the use of industrial-diamond drilling and increase the pace of its adoption. We must systematically investigate and test new

drilling technologies which are suited to our specific conditions and are at the world state of the art. We must also strengthen technical management, train a technical contingent, carry out effective drill construction, and engage in deep-probing scientific research. We must strive to modernize ore-geology prospecting engineering during the present century and catch up with the worldwide state of the art.

8480
CSO: 4008/25

PLA TECHNICAL RESEARCH UNIT SPURS GREATER OUTPUT BY TRANSLATORS

Beijing GUANGMING RIBAO in Chinese 11 Feb 83 p 2

[Article: "Information Office of a Certain PLA Research Institute Tries Out Quota Responsibility System," by Zhang Sanguang [1728 0005 0342]]

[Text] The information [or, intelligence] materials research office of a certain research institute of the People's Liberation Army is trying out a quota responsibility system with which it has already achieved notable results.

Its method is as follows: At the beginning of each year, the leaders of the office, in accordance with the technical job title and the state of health of each employee, and whether or not the employee has assumed other temporary duties, propose specific targets and quotas for the year on such forms of production as translation, proofreading, report compilation, collection of data, management of books and reference materials, and the editing, publishing, and distribution of two kinds of internal [restricted] technical publications, and then--after mass discussions of them--put them into effect. Those who complete their quotas in good fashion are granted commendations and rewards; those who do not--after a prompt analysis of the causes--are given assistance and guidance.

Experience of the past two years shows that this quota responsibility system has many advantages. First, it has changed the situation of the past whereby, regardless of what one's technical job title was or how much or how little work one did, everybody equally "ate from the same big pot." Second, every individual should be able to know pretty well what to expect for the entire year's work, which strengthens the planned nature of operations and the flexibility of specified assignments. Third, because quotas are explicit, the system has strengthened the operational sense of honor and duty and has provided the impetus for the launching of a revolutionary competition between technical personnel and between professional groups. Fourth, it makes it easier to conduct assessments, appraisals, and management. Using this system, we have overcome egalitarianism and raised operating efficiency. Before the adoption of this quota responsibility system, this office never translated more than about 800,000 characters [roughly 400,000 words] per year; over the past two years, it surpassed the mark of 1.2 million characters and, in 1982, it exceeded its assigned tasks by 28 percent. On the management of books

and reference materials alone, because the office adopted the initiative on more than ten new measures, including delivery of new books and reference materials directly to the task groups, the holding of periodic new book exhibitions, the maintenance of bulletin boards to publicize books and periodicals, and the printing and distribution each month of the XIN SHU BAODAO [REPORT ON NEW BOOKS], the rate of utilization of books and reference materials has been heightened. For foreign-language books and reference works, for example, the number of persons signing books out on loan in 1982 showed an increase of 31 percent over the previous year, and the number of volumes on loan increased 53 percent.

Because of this office's creative spirit in the organization and leadership of its professional work and its outstanding record of completion of tasks, it was recently adjudged to be an advance unit of the institute. Leading bodies at upper levels (the Bureau of Cartography and Goedesy of the General Staff), further, convened on "On-Site Meeting for the Exchange of Experiences in Intelligence Materials Work" at this office.

CSO: 4008/54

TIANJIN RADIO COMMENTARY ON REGIONAL TECHNICAL COOPERATION

HK110003 Tianjin City Service in Mandarin 2330 GMT 28 Feb 83

[Station commentary: "Emancipate the Mind, Resolve to Make Reforms and Create a New Situation in Regional Cooperation"]

[Text] Promoting economic and technical cooperation between areas is a prerequisite for social mass production and for the development of specialization. It helps in tapping the production potential in enterprises, rationally exploiting resources, rationally organizing the economy and stimulating technical progress. It is an important measure that allows us to invest little to achieve quick and plentiful results. It helps to enliven the economy and increase economic results.

Tianjin Municipality is an old industrial base of our country. It has traditionally formed close ties with various fraternal provinces and cities. With the continuous development of economic and technical cooperation between areas, this municipality will have ever closer ties with various fraternal provinces and cities. But due to the influence of leftist thinking and the binding effect of old administrative rules and regulations, certain comrades have not been emancipated enough in their minds. They do not have a clear idea of the nature and role of regional cooperation. Some people regard economic and technical cooperation work as an extra burden. Some are afraid that helping fraternal areas will only give rise to competition, hampering the development of their own products. Some even set this work in opposition to the realization of the strategic goal put forth at the 12th CPC National Congress and the accomplishment of current production tasks. Therefore, we must strengthen the study effort, raise our awareness, further emancipate our minds, and resolve to make reforms. Through cooperation, we must link the cooperative efforts between this municipality and other provinces and cities in realizing the task of quadrupling output. We must continuously probe and find a new path to economic and technical cooperation between areas, and make new contributions to the creation of a new situation in regional cooperation.

CSO: 4008/62

'GUANGXI RIBAO": UNJUST PUNISHMENT OF TECHNICIANS CRITICIZED

HK110435 Nanning Guangxi Provincial Service in Mandarin 1130 GMT 10 Mar 83

[Summary] GUANGXI RIBAO featured today in a prominent position of the front page a letter entitled "Why Should Enthusiastic Technical Support Be Punished?" by three readers (Zhou Peiquan), (Lin Mushen) and (Wei Lianxiong), technicians of the Nanning Shipping Administrative Office. The letter complained of their being punished for accepting 300 yuan remuneration for designing a barge for the second and stone company of Nanning. The letter requested departments concerned to try the case again according to the party's policies, so that scientific and technical personnel could make more contributions toward the four modernizations with ease of mind.

GUANGXI RIBAO also carried a commentator's article entitled "Actively Support Scientific and Technical Personnel to Engage in Scientific Work at Spare Time." The article pointed out: "Encouraged by the party's policies, (Zhou Peiquan) and other technicians were eager to help others and used their spare time to aid a collective enterprise which lacked qualified technical personnel to make designs. They received remuneration and this was regarded as a mistake. After reexamination, the departments concerned have decided to reissue their bonus and withdraw their self-criticism, so as to further implement the party's policies on intellectuals."

The commentator's article further said: "Under the premise of doing their own work well, some scientific and technical personnel have engaged in scientific and technical work in their spare time and made contributions to society. This spirit should be recommended and supported. The remuneration paid to them is also reasonable."

CSO: 4008/62

DAMAGE CAUSED BY TANGSHAN EARTHQUAKE IN 1976 DESCRIBED

Railway Damage

Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 4, 1982 pp 79-87

[Article by Zhang Mu [1728 3668], Li Yusheng [2621 7183 3932], Cheng Qingguo [4453 1987 0948], Li Riyue [2621 2480 2574], Zhu Shijie [2612 0013 2638], Zhou Shengen [0719 4377 2704], Lu Yaorong [4151 6460 2837], Hu Furong [5170 5346 5554], and Wang Tianwei [3769 1131 1218] of the Scientific Research Academy of the Ministry of Railways: "Damage to Railroad Structures in the Tangshan Earthquake"]

[Text] (Abstract) On 28 July 1976, an earthquake occurred in Tangshan. Railroads within the earthquake area in the seismic scale of 7 to 11 on the seismogram were damaged to varying degrees.

The trunk railroad lines in the earthquake area were 1,100 kilometers long, and 48.3 percent of them were damaged. According to the statistics, 39.4 percent [76] of 193 bridges were damaged. During the earthquake, a large area of the foundation collapsed, and embankments split, collapsed, and settled. Railroad tracks were bent, slopes of the banks on both ends of bridges slipped, piers became slanted and broke, bridge structures smashed against each other and even collapsed. Widespread damage also occurred in other structures, such as communications signals, station and yard facilities, water supply systems, and industrial and civilian buildings.

Seven traveling trains derailed, some cars overturned, and railroad transportation was interrupted. The earthquake damage was very serious.

I. General Description

On the morning of 28 July 1976, an earthquake on a scale of 7.8 on the seismogram occurred in the Tangshan area. That evening, an aftershock of 7.1 on the

seismogram occurred, causing earthquake damage to a large area. The area of the earthquake is an important industrial region. There are more railroad lines, including the two trunk lines of the Beijing-Shanhaiguan line and the Tongxian-Tuozitou line, other branch lines, and special lines, including the Hangu-Nanbao line, the Tangshan-Zunhua line and the Tianjin-Jixian line. The earthquake area was in the eastern Hebei Plain. To the north, the Zunhua and Qianan areas are next to the mountains. The topography is high in the northwest and low in the southeast. Rivers basically flow from north to southeast into the Bohai. The geological strata are alternating strata of expansive Quaternary alluvial fan of the river facies and marine deposits. The underground water table is very shallow. The area between Tianjin and Lutai is near the ocean. The sedimentary strata are thicker. The area is mostly type III or type II soil. The soil texture of the foundation consists mostly of loose, powdery, fine sand or soft, puddly and sandy clay. The soil is weak and easily deformed by earthquakes.

Because the seismographic scale of the earthquakes was large, the duration of seismic activity was long, and the soil texture of the earthquake area was poor, railroads were seriously damaged. The sections more seriously damaged by the earthquake were between Tanggu and Changli on the Beijing-Shanhaiguan line, between Tuozitou and Fengren on the Tongxian-Tuozitou line, and the Hangu-Nanbao line. Within the area in which the earthquake [registered] over 7 on the seismogram, there were 1,100 kilometers of trunk lines, 533 kilometers or 48.3 percent of which were damaged. Earthquake damage to bridges was generally widespread and serious. Other facilities, such as communications signals, station and yard facilities, water supply and drainage works, railroad stations, factory buildings, warehouses, and workers' dormitories were also damaged to varying degrees. Seven traveling trains derailed. Individual cars overturned. The earthquake interrupted railroad transportation. The areas of severe earthquake damage on the Beijing-Shanhaiguan line, the Tongxian-Tuozitou line, and the Hangu-Nanbao line are shown in Figure 1.

II. Foundation

The railroad foundation in the earthquake area was mostly low embankments 3 to 4 meters high. There were few cuttings and supporting structures. The filler of the road embankments was all clay, except for that on the Tongxian-Tuozitou line.

1. Earthquake Damage

The sections of road embankments that were seriously damaged were between Tanggu and Chadian on the Beijing-Shanhaiguan line, between Tangfang and Xugezhuang, Kaiping and Guye, followed by the sections between Chadian and Tangfang and between Beijiadian and Luanxian, extending about 100 kilometers. Damage was also serious between Yinchengpu and Jiugezhuang northbound on the Tongxian-Tuozitou line, and the Tangshan-Zunhua and Hangu-Nanbao branch lines and special lines.

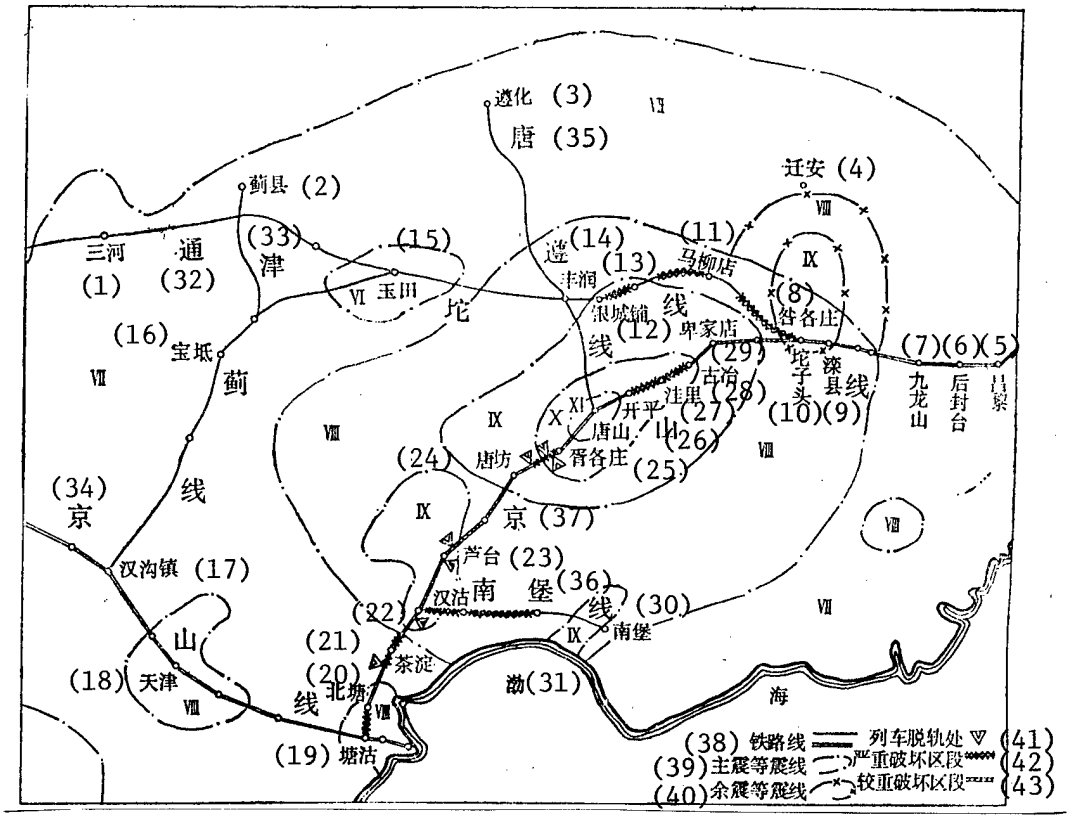

Figure 1. Map of Areas of Severe Earthquake Damage on the Beijing-Shanhaiguan Line, Tongxian-Tuozitou Line, and Hangu-Nanbao Line

Key:

1. Sanhe
2. Jixian
3. Zunhua
4. Qianan
5. Changli
6. Houfengtai
7. Jiulongshan
8. Jiugezhuang
9. Luanxian
10. Tuozitou
11. Maliudian
12. Beijiazhuang
13. Yinchengpu
14. Fengren
15. Yutian
16. Baodi
17. Hangouzhen
18. Tianjin
19. Tanggu
20. Beitang
21. Chading
22. Hangu
23. Lutai
24. Tangfang
25. Xugezhuang
26. Tangshan
27. Kaiping
28. Waji
29. Guye
30. Nanbao
31. Bohai
32. Tongxian-Tuozitou line
33. Tianjin-Jixian line
34. Beijing-Shanhaiguan line
35. Tangshan-Zunhua line
36. Hangu-Nanbao line
37. Beijing-Shanhaiguan line
38. Railroad line
39. Isoseism of the main earthquake
40. Isoseism of aftershock
41. Location of derailment
42. Severely damaged section
43. Section of relatively severe damage

Damage to road embankments was manifested mainly be settlement, serious splitting, or collapse and slippage thus brought about. Settlement can also be divided into two situations: a relatively large area of even settlement and a relatively short distance of uneven settlement. The former did not affect the operation of trains much. For example, serious upsurge of water and sand occurred in the front and back of the construction area between Tangfang and Xugezhuang. It can be seen from the lid of a deep well that protruded 24 centimeters above the ground surface that the ground surface there settled but the railroad line was still level and smooth. Only a few cracks occurred on the road embankment.

Uneven settlement can also be divided into lateral uneven settlement and longitudinal uneven settlement. The road embankments split longitudinally, and the sideslope collapsed and staggered. These were the results of uneven settlement due to lateral earthquake damage. In general, the tracks at the center of the road embankment carry a greater load. When the earth foundation was affected by the earthquake and its strength weakened, relative settlement occurred to a greater degree and thus longitudinal cracks occurred along the railroad line. At the same time, under the repeated action of lateral earthquake movement, displacement of the sideslopes occurred and this widened the cracks, or the sideslopes collapsed. The width of the cracks was mostly 0.1 to 0.3 meter, and the cracks were frequently accompanied by staggered steps of 0.1 to 0.15 meter. Small cracks could be repaired and the railroad line could be opened to traffic. But when the settlement was larger, large cracks and even wide trenches were formed. Photo 3 [not reproduced] shows one case of this. The width of the trench was about 1 meter, and the difference in height of the two sides of the trench was about 0.5 meter.

Photo 4 [not reproduced] shows that the foundation seriously liquefied within the area in which the earthquake [registered] 10 on the seismogram, and the road embankment was damaged.

Longitudinal uneven settlement was due mainly to the different conditions of the foundation under the road embankments of each section. At many places on the Beijing-Shanhaiguan line, settlement, deformation, and undulations reached 1 meter. A section of the road embankment near Beitang Station formed a staggered step after the earthquake, and the embankment rose about 1 meter. These types of longitudinal and lateral uneven settlement generally occurred together.

It is worth mentioning that in the area of the earthquake with an intensity over 8 on the seismogram, almost without exception the road embankments at the ends of bridges showed varying degrees of settlement from 10-20 centimeters to a maximum of 2-3 meters.

2. Brief Analysis of the Causes of Earthquake Damage

Surveys showed that the extent of damage to road embankments (except at the ends of bridges) was determined mainly by the ability of the foundation to resist earthquakes. All seriously damaged sections had foundations of weak, soft clay or loose, saturated, powdery, fine sand. The main cause of damage

to the road embankment was liquefaction of sand and soil and the loss of load-bearing strength of the foundation. If the ability of the foundation to resist earthquakes were better, then regardless of how intense the earthquake, the damage to the road embankment would be lighter. For example, the foundation of the section between Xugezhuang and Kaiping on the Beijing-Shanhaiguan line in the extreme earthquake area was located in the piedmont alluvial and diluvial plain. The sand strata were densely packed, the N value of the staff gage level was mostly over 30, and underground water was at a greater depth. During the earthquake, upsurge of water and sand did not occur. After the earthquake, the railroad line and the road foundation remained intact.

Secondly, the damage to the road embankment was closely related to the properties of the filler. Clay filler had a better earthquake resistance than did sandy soil. The northbound section of the Tongxian-Tuozitou line was built with sandy soil as the filler. The strength of cohesion was very weak, and with liquefaction of the foundation, damage was very serious. The 6-meter-high road embankment settled nearly 2 meters. The sideslope changed from the original 1:1.5 to 1:2.

Therefore, railroad lines in earthquake areas generally should not pass through seriously liquefied sections. Sandy soil should not be used as a filler. And this should especially apply to high road embankments.

III. Tracks

The structural standards of the railroad tracks in the earthquake area at Tangshan were not uniform. The northbound and southbound sections between Chadian and Tangshan on the Beijing-Shanhaiguan line, the northbound section between Jiulongshan and Houfengtai, and the southbound section from Tuozitou to Jiulongshan (a total of 164.8 kilometers) and between Maliudian and Yanggezhuang on the Tongxian-Tuozitou line (about 16 kilometers) all used 50-kilogram-per-meter steel rails, concrete ties, and seamless rails. The other sections of the two trunk lines mentioned above and the branch lines and special lines in the earthquake area were all ordinary rails with wooden ties.

1. Earthquake Damage

The structural damage to the railroad tracks in the earthquake area was caused not only by the direct action of ground surface movement, but most of it was caused by damage to the railroad foundation and to bridges and culverts. The main forms of earthquake damage to the railroad tracks were manifested as wavelike undulations of the rails, bending and deformation of the steel tracks, enlargement of the track seams, and even pulling apart of the steel rails.

(1) Bending and Deformation of Steel Tracks

From Beitang to Luanxian on the Beijing-Shanhaiguan line and from Fengren to Tuozitou on the Tongxian-Tuozitou line, almost all of the steel tracks in

between were bent and deformed. At serious places, the radius of curvature of bending was 10 to 50 meters, and the steel tracks were bent into dead ends. The northbound and southbound segments from Tangu to Xugezhuang on the Beijing-Shanhaiguan line extended a total of 152 kilometers. Dead-end bends of steel tracks had to be sawed off at 106 places, and 12.95 kilometers of tracks had to be replaced by new ones. The 24.5-kilometer special railroad line of the Hangu-Nanbao line had 33 dead-end bends.

Most of the bent steel tracks occurred in places where the road foundation settled and where rock fragments settled and collapsed. The road foundation was most seriously damaged between Beitang and Xugezhuang on the Beijing-Shanhaiguan line and near Wali and Tuozitou, and, correspondingly, bending and deformation of the steel tracks were more serious. But with a lower structural standard of the tracks, even when the road foundation was not damaged, steel tracks might also bend seriously. For example, the special line of the Tanggu Honeycomb Coal Plant used P43 steel tracks 12.5 meters long; 1,120 ties per kilometer had been laid without cushioning plates; and there was a serious lack of rock pavements. After the earthquake, the steel tracks bent, the wavelength was 25 meters, and the vector reached 1.8 meters.

Seventy-six large, medium and small bridges on the Beijing-Shanhaiguan and Tongxian-Tuozitou lines were damaged by the earthquake. Bent steel tracks occurred at most ends of bridges. Fifteen bridges between Tanggu and Xugezhuang were damaged by earthquake. Bent steel tracks at the ends of bridges occurred at 14 places. The most typical was the Hangu Bridge. The steel tracks on the bridge and at the end of the bridge bulged and bent, and even the shuttle tracks at either end of the bridge were damaged; flat-tail joining plates were bent and the flat-tail bolts were pulled apart.

The bending of the steel rails was caused mainly by the loss of stability under the longitudinal and lateral forces of the earthquake on the tracks. At places where the road foundation settled, slipped, and collapsed and where the rock pavements settled and collapsed, the lateral resistance of the tracks weakened or the tracks lost lateral resistance, and thus such damage was worse.

(2) Enlargement of Track Seams and Pulling Apart and Breaking of Steel Tracks

In the earthquake area, a common occurrence was the pulling apart of flat-tail bolts and the subsequent enlargement of the track seams. At serious places, the track seams expanded to 260 millimeters. This type of earthquake damage existed both on ordinary railroad tracks and on seamless [continuous-weld] railroad tracks. The situation on some special railroad lines was even more serious. At one place on the Yujiapu Warehouse special line in Tanggu, the track seams had been pulled 300 centimeters apart.

At two places on the tracks at Lutai Station, the steel tracks were pulled apart and broke off. One was on the second track of the trunk line. It was a seamless railroad track with concrete track ties. The tracks at the place

where they broke off showed a simple wave bend, and there were no gaps on the section of the tracks that had broken off. The length of the broken seam was about 400 millimeters. The other place was on the fourth track. It was a P43 short rail. An oil tank car derailed where the steel track broke off.

Both the enlargement of the track seam and the breaking off of the steel tracks were caused by the pulling force of the earthquake on the tracks. After the earthquake, the longitudinal displacement of the tracks was measured and it was discovered that large sections of the steel tracks were displaced longitudinally. The steel tracks produced longitudinal pull and pressure.

2. Analysis of Seamless Railroad Tracks

The Beijing-Shanhaiguan and the Tongxian-Tuozitou lines were paved with seamless railroad tracks. Because the structure of the seamless railroad lines in our nation is of the temperature-stress type, they have a higher temperature strength in severe winter and extremely hot seasons than do ordinary railroad lines. This definitely affects damage by earthquake. But during the Tangshan earthquake, the temperature at the time of the earthquake was from 20° to 23°C. Since the lock-in temperature of the seamless railroad tracks was 21° to 31°C, the internal temperature strength of the tracks was small, and there was little bending and enlargement of the steel tracks.

Although ordinary railroad lines have more track seams, the track seams are not enough to ease the serious bending of steel tracks. According to calculations, the bending wavelength of the steel tracks was 25 meters, the vectors were respectively 0.6, 0.8 and 1.0 meter, and the corresponding difference between the length of curvature and the straight-line length was 4.0, 7.0 and 11.0 centimeters. For the 12.5-meter steel tracks, there were only three track seams within a length of 25 meters; this was not enough to compensate for the difference in length described above. Therefore, within the area of the same seismic intensity, bending occurred on long steel tracks as well as on short steel tracks. The most obvious example was at the Lutai Railroad Station. The station had a total of eight sets of tracks, and bending of the steel tracks occurred on seven of them. Two were seamless railroad tracks, and the rest were ordinary railroad tracks.

IV. Bridge and Culvert Structures

Most bridges on the Beijing-Tangshan line, with the exception of a few individual ones, were built before Liberation. The largest span of the steel bridges is 62.8 meters with bottom-supported truss beams (Jiyunhe Bridge). Bridges on the remaining lines have all been built since Liberation. Most of them have reinforced concrete (including pre-stressed concrete) beams. The largest span is 31.7 meters. There are many types of foundations. Medium and small bridges mainly have enlarged base gravity piers. Most piers of medium and small bridges on the Beijing-Shanhaiguan line have wooden pile bases. The bases of large bridges include open caissons, reinforced

concrete cylindrical piles (hammered piles), and poured piles. The maximum height of the piers and platforms is about 15 meters, and the general height is from 1.5 to 7 meters. The foundation is mostly type III soil (loose water saturated soil) or type II soil. There is very little type I soil. The seismic intensity of that region was originally set at 6°. In the design, no consideration was given to earthquake-proof fortifications. Prior to the [Tangshan] earthquake, the ends of the beams of important bridges used a simple linkage to prevent the body of the bridge from collapsing during an earthquake. According to statistics on four railroad lines--the Beijing-Shanhaiguan line, the Tongxian-Tuozitou line, the Tianjin-Jixian line, and the Hangu-Nanbao line--there were 193 large and small bridges; 76 of them, or 39.4 percent of the total, were damaged by the earthquake (42 bridges received medium-scale damage, and 34 bridges were seriously damaged).

1. Earthquake Damage

Damage to bridges and culverts can be divided mainly into the following six types:

(1) Settlement of road embankments at the end of bridges, and shortening of bridge openings. These were the most common occurrences of earthquake damage to bridges. In the areas where the earthquake [registered] above 7 in intensity on the seismogram, the body of earth on the two banks of almost all bridges built on ground of type III soil slid. The road embankments at the end of bridges settled or collapsed. The settlement was far greater than that caused by instability of ordinary abutments. For example, the road embankment at the end of the No 6, No 7, No 8 and No 9 bridges on the northbound Tongxian-Tuozitou line settled an average of 1.84 meters. The two banks of the No 6 bridge settled 2.9 meters and 2.3 meters, respectively, and this caused the railroad tracks to become suspended. The road embankment of 21 of the bridges No 49 through No 122 on the Beijing-Shanhaiguan line settled an average of about 0.8 meter, while some individual bridges settled as much as 3.0 meters. As the body of earth on the slope of the banks slid, the abutments moved toward the center of the river. The bridge opening shortened, and this brought about a series of chain reactions in earthquake damage; the ends of the beams collided, the supports toppled, and even the bridge piers broke off. The higher the seismic intensity, the looser the soil texture of the foundation, the smaller the bridge opening. For example, the Jiyunhe Bridge on the southbound Beijing-Shanhaiguan line was situated in a 9° area. It was 183.6 meters long, and the earth at the foundation was puddly, sandy clay. The bridge had a wooden pile base. The abutments at both ends of the bridge moved toward the center of the river, all of the seams in the beams of the bridge were closed tight, and the gaps shortened 2.25 meters. The beams of the first, third, and sixth openings slipped out of the bridge pier, and the steel plate beam pierced and broke the breastwork of the abutments and penetrated, respectively, 40 and 130 centimeters into the road foundation.

(2) The piers settled and were displaced. Besides the longitudinal (along the direction of the bridge) displacement caused by the sliding of the abutments toward the center of the river, the bridge piers were also likely to

manifest lateral displacement or slanting under the force of the earthquake. For example, the top of the No 4 pier of the Jiyunhe Bridge on the southbound Beijing-Shanhaiguan line was displaced 1.12 meters laterally. The steel rails on the bridge also bent. Also, the Luan He Bridge was located in the 8° area during the main earthquake and in the 9° area during the aftershock. It was a duplicate-line bridge with a two-opening span supported by 9.14-meter reinforced concrete arches and a 31.5-meter top plate beam with 20 openings (the southbound line was a 31.75-meter top plate beam). The entire length was 677.4 meters. The No 1, No 2, and No 3 piers were enlarged bases, and the rest were caisson bases. The top of the No 11, No 13, No 16 and No 21 piers were displaced upstream, with maximum displacement reaching 7.1 centimeters. The rest of the piers and the Shanhaiguan abutment were displaced downstream, reaching a maximum of 5.9 centimeters. In addition, some piers also underwent varying degrees of settlement, such as those of the Xinhua He Bridge (duplicate-line bridge) on the Beijing-Shanhaiguan line. The No 6 pier settled 7 centimeters. The abutments of the No 77 bridge settled 6 and 7 centimeters. Two piers of the northbound portion of the Jiyunhe Bridge on the Beijing-Shanhaiguan line settled nearly 60 centimeters.

(3) The body of the pier or the body of the abutment broke. The main causes were [either] that the body of the beam underwent joint movement along the direction of the bridge under the horizontal force of the earthquake and repeatedly pushed against the piers, causing them to split, or that sliding of the slopes of the banks forced the piers to move toward the center of the river, thus subjecting the piers to shear and bending and they broke. The breaking position may be at a weak section (such as construction seams that had not been fortified or places where the mortar strength was not strong enough), or at the section where the bending stress was the greatest. The No 16 pier of the Luan He Bridge showed ring-like splitting on the top of the supporting platform. The width of the crack reached 1 centimeter. There were also some bridge piers that split open at the place where the bottom of the supporting platform and the caisson joined.

The Dou He Bridge on the Tangshan-Zunhua line was located in the 10° area. It had a 3-opening, 16-meter reinforced concrete beam. The full span was 48.3 meters. The T-shaped concrete abutments were 8.76 meters high, with an enlarged base built on a fine sand layer. The cylindrical concrete piers were 7.4 meters tall, with piles planted as the base. The piles were 24 meters long. The soil surrounding the piles was an intercalation of sand and sandy clay. After the earthquake, the abutments at both ends slid toward the center of the river (the Tangshan end abutment slid 1.5 meters; the Zunhua end abutment slid 2.23 meters). But the distance between two piers did not change. The body of the beam moved jointly toward the direction of Tangshan. The upper part of the abutment on the Tangshan end was subjected to the push of the body of the beam toward the bank. The bottom part was subjected to the sliding force of the riverbank toward the center of the river. The abutment was split into three segments along the construction seam. The joint movement of the body of the beam caused the support to carry the top of the No 1 and No 2 piers in a longitudinal displacement toward the direction of Tangshan. The two piers broke at the construction seam 4.5 meters

below their caps. The body of the pier inclined 20° toward the direction of Tangshan. The remaining parts that were not broken were subjected to pressure and were damaged.

The abutment of the No 6 bridge on the northbound Tongxian-Tuozitou line split after horizontal staggering. The Tongxian end abutment broke horizontally along the construction seam about 2 meters from the ground surface. The width of the seam reached 5 centimeters. The top and bottom parts of the abutment staggered 5 centimeters and the pressure cracked the bottom part of the abutment, as shown by a vertical crack.

(4) Damage to the supports. This included inclination of the supports, toppling of the supports, displacement or falling into the river, breaking of the latches, breaking of the bolts of the earthquake-proof plates, twisting of the anchor bolts, or breaking by shearing. Twenty-two, or 58 percent, of the supports of the 38 bridges damaged by sliding of the bank slope were damaged, and anchor bolts of 19 supports broke because of shearing. The toppling of mobile supports is shown in Photo 17 [not reproduced].

(5) Damaged or collapsing beams. The earthquake-proof properties of the steel beams or reinforced concrete (including prestressed concrete) beams were good. But under the longitudinal force of the earthquake, the concrete at the end of the beam was crushed as a result of collision. Under the lateral force of the earthquake, the beams were displaced laterally. The northbound Tongxian-Tuozitou line is about 5 kilometers long [as published]. Seven of nine bridge beams were displaced laterally from 25 to 210 centimeters. The welded seam of angular steel joints of the dividing wall between the two beams of the No 6 bridge pulled apart and broke. The body of the beam separated, and one beam fell into the river.

(6) Culverts split or collapsed. This was common damage by the earthquake in the earthquake area. Splitting was especially common where the winged walls joined the body of the culvert. In addition, the protective facilities of the culverts generally collapsed and cracked.

2. Brief Analysis

In the Tangshan earthquake, [the causes of damage to] 38 of the 76 bridges damaged by the earthquake were closely related to the sliding slopes of banks and shortening of the bridge openings. The main cause was that the condition of the texture of the soil of the foundation was poor. For example, the Beijing-Shanhaiguan line has five bridges situated in the area of Tangshan Municipality, where the earthquake registered 10° or 11°. Because the foundation was of relatively densely packed clay, the earthquake damage was not severe. Although the Xin He Bridge in Yongding and the Jiyunhe Bridge were situated in the 7° or 8° areas, both were seriously damaged by the earthquake because the foundations were of puddly clay or mild clay. Also, for example, the Luan He Bridge was situated in the 8° area. The abutment on the Beijing side and the No 1 to No 10 piers were built on base rock. Earthquake damage was slight. But the No 11 to No 21 piers and the abutment on the Shanhaiguan side were built on a clayey layer, and damage was serious. For the same

bridge, the difference was great. Therefore, in selecting the location of bridges we should pay a great deal of attention to engineering geological conditions.

Secondly, the types of foundations are also important factors affecting the degree of damage by earthquake. Common pile foundations are better than caisson and enlarged bases. Deep bases are better than shallow bases. For example, the No 1 to No 9 bridges on the northbound Tongxian-Tuozitou line were built on a saturated, fine-sand layer, and therefore they used shallow, enlarged bases. They all were damaged severely. The beam of the No 6 bridge even fell. Also, for example, the northbound and southbound bridges of the Jiyunhe Bridge on the Beijing-Shanhaiguan line both had puddly, mild clay for foundations. The foundations of the No 1 and No 3 piers of the first bridge were 8-meter-deep caissons. Because the depth was too shallow, the piers settled about 60 centimeters. The five piers of the latter were all wooden pile bases. They were generally placed deeper into the ground than the caissons described above. After the earthquake, the relative difference in the height of the piers showed no visible change. Also, for example, the No 13, No 15, and No 16 bridges on the Hangu-Nanbao line used reinforced concrete cylindrical piles 28 to 30 meters long with a 40-centimeter diameter. After the earthquake, deformation of all the piers was very slight.

The quality of construction must be concretely guaranteed. The bridges in the earthquake area all had gravity piers. The designs did not consider the earthquake load, and construction seams were not treated. After the earthquake, the piers broke mostly at the concrete construction seams or rock masonry mortar seams. Therefore, in construction, the treatment of construction seams or mortar seams is very important. Surveys showed that in the 9° and 10° areas on the Beijing-Shanhaiguan line, there were 103 concrete and rock masonry piers that were not damaged. It can be seen from this that in the 10° area, if the height of the pier is less than 10 meters, if the foundation is good, and if the quality of construction is guaranteed, concrete or high-grade mortar and rock masonry can still be used.

The earthquake revealed that the earthquake resistance of supports was very poor. They could not bear the longitudinal or lateral force of the earthquake on the beam structure, and thus many supports were dislodged and anchor bolts broke off. In particular, the joining screw bolts that join the reinforced concrete beam and the top plate of the support are very difficult to repair after they are broken. We should launch a study of earthquake-proof supports so that each part of the support (including joints) has the same ability to resist earthquakes.

The earthquake resistance of steel beams and reinforced concrete beams (including prestressed beams) is better. Except for local damage due to ramming, no other problems were discovered. But the joining of reinforced concrete transverse plates was weak. In designing, we should consider strengthening the wholeness of the beam structure.

Some simple and easy methods to prevent beams from collapsing--such as the joints at the end of steel beams, and steel springs at the end of reinforced concrete beams--proved to be effective in this earthquake. They can be improved and included in the standard design for the beam structure so that they can be popularized when new bridges are built.

V. Other Railroad Structures and Facilities

Among the other railroad structures and auxiliary facilities, the firmly connected (especially the joints with the foundation) steel and wood structure generally could withstand an earthquake intensity of 10 to 11 on the seismogram. For example, the steel overhead walkway and the light tower at the Tangshan Station near the center of the earthquake and the wooden rain shack remained basically intact after the earthquake. Most of the reinforced concrete water towers had a stable foundation, and even those in areas where the earthquake [registered] over 8 on the seismogram did not topple. Most of the water towers built of brick collapsed and were damaged in areas registering 7 on the seismogram.

Underground structures have good earthquake resistance. Except for the entrances and exits, they remained generally undamaged.

The damage by earthquake to railroad factories, office buildings, hospitals, schools, railroad engineers' apartments, housing for dependents, public facilities, and such housing structures was the same as the damage to ordinary industrial and civilian structures. But structures directly related to railroad transportation and engineers' cabins, communications machinery rooms, and substations frequently collapsed and the equipment inside was destroyed, leading to an interruption of communications. The automatic shutoff plug malfunctioned, seriously affecting the restoration of railroad transportation.

Conclusion

The Tangshan earthquake caused severe destruction and loss of railroad buildings. Transportation was interrupted, and this directly affected the work of earthquake resistance and rescue works. Ours is a nation with many earthquakes. Railroads also are the artery of the national economy. Therefore, actively developing railroad earthquake-resistance work has an especially important meaning.

Based on surveys of earthquake damage, the following opinions are presented for earthquake resistance and prevention for railroad structures:

1. When building railroads in earthquake regions, we should pay a lot of attention to engineering geological conditions and review carefully in selecting the construction sites for important structures. The design should consider earthquake-proof requirements, use rational structural measures, and guarantee the quality of construction.

2. Key preventive measures should be implemented in important projects that are very important to the operation of the railroads and that are difficult to repair and restore after destruction (such as long and large bridges), and functional structures that are extremely important to guaranteeing normal railroad operations (such as train-scheduling organization and command centers, communications signals system, and water supply and power supply systems).

3. We should actively develop research on earthquake-proof railroad structures. At present, the major subjects of research should include the following:

(1) On the basis of macrocosmic surveys, we should combine the characteristics of earthquake damage, revise the references for determining intensity, and establish earthquake-proof standards for important railroad structures.

(2) We should study and establish methods and standards for determining structural earthquake-proof properties of railroad buildings.

(3) To gain an indepth understanding of the pattern of distribution of the intensity of earthquakes and the effect of earthquake damage on railroads, we should study the characteristics of ground surface motion and the effects of topographic and geological factors upon ground surface motion.

(4) We should study the problem of liquefaction of sand and soil under the effect of earthquakes.

(5) On the basis of macrocosmic surveys, on-site tests, and laboratory-simulated experiments, we should study the computational theory concerning earthquake resistance of structures, and establish a rational computational method and computational parameters.

(6) We should study earthquake-proof measures for various types of railroad structures and facilities.

(7) We should study new types of materials for earthquake prevention and for earthquake-resistant and earthquake-tolerant materials.

(8) We should study [the problem of] warnings in the case of strong earthquakes--especially the problem of how to notify running trains in time so that they can take emergency measures to prevent derailment.

Damage to Tianjin Docks

Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese
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[Article by Meng Zhaohua [1322 2507 5478] of the First Navigational Engineering Survey and Design Academy of the Ministry of Transportation: "Earthquake Damage to the Pile-Elevated Docks in the Tianjin Area During the Tangshan Earthquake"]

[Text] I. Engineering Situation

The harbors (Tianjin Xingang) in the Tianjin area and the river docks (on the two banks of the Haihe in Tanggu Ward in Tianjin) are situated at the west end of the Bohai and at the tail end of the waterway of the Haihe where it enters the sea. Within several dozen meters under the ground surface are mainly alluvial deposits of river delta facies and marine facies deposits of the Holocene of the Quaternary of the Cainozoic Era. The surface-covering layer is very thick. The natural water content of the ground surface soil layer is greater than the liquid limit, the porosity ratio is greater than 1.0 to 1.5, and the soil is puddly soil. Strata of silt and silver sand ($N_s \geq 37$) are distributed 20 to 24 meters below the ground surface. According to such conditions of the foundation, construction of docks in that area since the 1950's has mostly used the pile-elevated and supported platform structure, simply called pile-elevated docks.

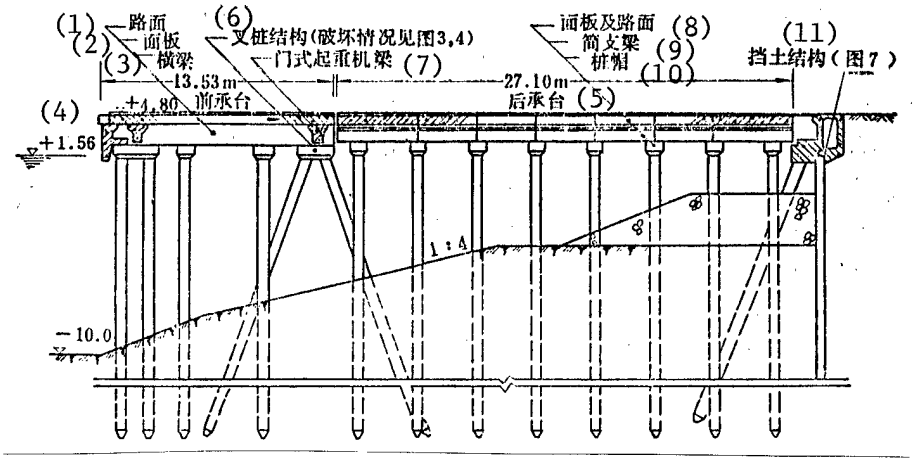

Figure 1. Cross-section illustration of the pile-elevated docks at seaports (ninth berth of Xingang, Tianjin; elevation in meters)

Key:

1. Road surface
2. Surface board
3. Crossbeam
4. Front-supported platform
5. Rear-supported platform
6. Fork-pile structure (see photos 3, 4 for damage) [photos not reproduced]
7. Gantry-crane beam
8. Surface board and road surface
9. Simple supporting beam
10. Pile cap
11. Earth-guard structure

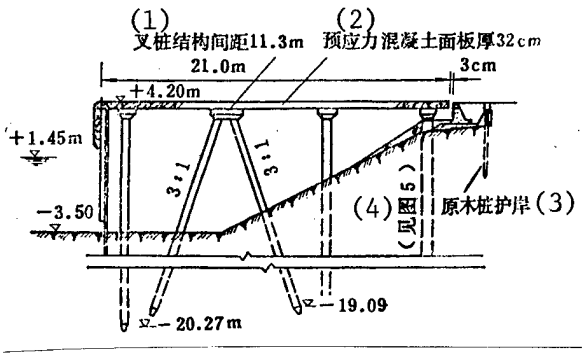

Figure 2. Cross-section illustration of pile-elevated docks of river harbors (Yujiabao foreign trade dock)

Key:

1. Distance between fork-pile structure 11.3 m
2. Prestressed concrete surface board is 32 cm thick
3. Logpile-protected bank
4. (See Photo 5) [photo not reproduced]

The pile-elevated docks of the seaports in the Tianjin area are mainly for docking oceangoing ships. The depth reaches about 11 meters. According to the conditions of stability of the slope of the bank below the docks, the width of the docks is generally about 40 meters, and the docks are placed in a continuous stretch in the same plane and joined to the land. According to the requirements for loading and unloading operations on the docks, the docks are divided into a front- and a rear-supported platform along the full width. The front-supported platform supports a gantry crane and railroad tracks for trains, and serves direct loading and unloading between ships and trains. The foundation has straight piles and also forked piles that support the horizontal load of docked ships and the vertical loads that they should support. The rear-supported platform supports the vertical load of piled freight; therefore it only has straight piles. The base piles are spaced 7.0 to 10.5 meters apart. The rear edge of the rear-supported platform has an independent earth guard to guarantee connection with the land. See Figure 1.

The pile-elevated docks of river harbors in the Tianjin area are shallower, the docks are narrower, and generally there are no railroad tracks or front- and rear-supported platforms. According to requirements in force, the planar arrangement is a continuous expanse connected to land, or "L" shaped or "⊥" shaped arrangements. The docks and the land are connected by landing stages. Beneath the docks are straight piles and inclined piles. See Figure 2.

The base piles of the pile-elevated docks use prefabricated, hollow-core, square piles sunk from above the water surface. The structure of the upper part uses prefabricated plates and beam structures, and on-site pouring joins them into a unit. The joints are connected by steel members, welded or by ring-shaped steel members. In general, the proportion of concrete used in

the prefabricated parts constitutes about 3/4 the amount of concrete used in construction. The amount of prestressed concrete work constitutes 61 percent.

II. Basic Situation of Earthquake Damage

On 28 July 1976, the Tangshan earthquake spread to the Tianjin area with a basic intensity of 7 degrees on the seismogram, and damage occurred mostly in the abnormally affected areas where the intensity was 8 or 9 degrees. Tanggu was within the abnormally affected area of 8 degrees of seismic intensity. After the earthquake, 40 pile-elevated docks in that area were surveyed. Statistics and categorized data (Table 1) on the earthquake damage showed that earthquake damage to the pile-elevated docks of river harbors was more severe than that at seaports. The basic situations of earthquake damage are described below.

Table 1. Survey of Earthquake Damage to Pile-Elevated Docks

Type	Damage	Statistics on earthquake damage to pile-elevated docks: Seaports (22)	River docks (18)
I	Severe damage: Docks toppled, and the entire supported platform was visibly deformed; pile bases and upper structures and earth-guard structures were seriously damaged and were difficult to repair and restore.	0	4
II	Serious damage: The entire supporting platform did not show visible deformation; the upper structures were damaged; the pile bases and earth-guard structures were severely damaged but could be repaired and restored.	6	4
III	Medium damage: Deformation of the entire supported platform was not obvious; the upper structures were not damaged; the pile bases and earth-guard structures were damaged but could be repaired and restored.	7	4
IV	Intact or basically intact: The pile bases and earth-guard structures were slightly damaged or not damaged.	9	6

(I) The entire pile-elevated docks at the seaports did not show visible deformation after the earthquake. Many cracks in the ground behind the severely damaged pile-elevated docks of river harbors occurred, and the slopes of the banks slipped and lost stability, causing the entire dock to deform or topple. Because there were no longitudinal inclined piles, the rigidity of

the whole structure of the docks in the longitudinal and lateral directions was different, and twisting and deformation occurred after the earthquake.

(II) The structural seams of the upper structure of the pile-elevated docks were pulled apart or were forced tightly together by the earthquake (such as the gaps between the front- and rear-supported platforms, between the rear-supported platform and the earth-guard structure), but the beam plates were seldom damaged. In the case of docks of river harbors where the upper structure of the docks did not consist of beam plates (as in Figure 2), the surface plates at the fork piles were pushed upward and were bulging, producing longitudinal cracks of ordinary length, and radial cracks emerged in some places.

(III) Earthquake damage to the pile bases:

The most common earthquake damage to the pile bases was the damage to the fork-pile structures. The fork-pile structure consisted of a bidirectional inclined pile with a pile cap poured on-site. During the earthquake, the fork pile structure was subjected to an overly large horizontal force, and earthquake damage was manifested as follows: The pile inclined toward the bank broke and split; the top part of the pile inclined toward the ocean (river) was displaced; and the inclination of the pile became steep; but the body of the pile was not damaged. The concrete of the pile cap split open in cases of slight damage, but in severe cases it broke off due to shearing. Survey statistics showed that there were 574 pairs of fork-pile structures under the pile-elevated docks at the seaports. After the earthquake, only 10.6 percent remained intact. There were 366 pairs of fork-pile structures under the river harbor docks; after the earthquake, only 14.5 percent [53] remained intact.

A lesser number of straight piles of the front-supported platforms of pile-elevated docks were damaged by the earthquake. Bent or broken straight piles caused by deformation or slipping of the slopes of the banks was more outstanding among the pile-elevated docks at river harbors. The straight piles of the rear-supported platform and the upper structure were linked by simple props, and the piles above the surface of the mud had a definite free length which provided a definite flexibility, and so the earthquake damage was less severe. Damage to straight piles near the banks was caused mostly by displacement of the earth-guard wall on the banks.

Two straight piles and two slanted piles were selected from the No 9 to No 11 berths of the pile-elevated docks that had been seriously damaged by the earthquake at Xingang harbor, Tianjin. A rock core drill was used to drill holes into the piles from the dockside, and an underwater camera was used to inspect the interior of the pile. The observed results showed that the two straight piles (including the pile caps) had no cracks. Because the direction of the hole did not line up with the axial line of the slanted piles, one of the slanted piles was drilled through, and the depths that could be observed were 7.9 and 9.1 meters, respectively. The internal cracks of the piles above the mud surface were consistent with and corresponded to the surface cracks on the piles. The situation underneath the mud surface could

not be learned. In addition, it was observed through the drilled holes that there were more cracks in the interior concrete of piles with damaged caps, and the interior concrete in some even became fragmented. All poorly constructed component joints poured on-site showed hidden cavities or honeycomb structures at the joining surfaces.

(IV) Earthquake damage to the earth-guard structure. The deformation or slippage of the slopes of the banks after the earthquake caused the earth-guard wall built in the rear of the pile-elevated docks of river harbors to settle, to become slanted, or to topple. Although the earth-guard structure of the plate piles built at the rear of pile-elevated docks at seaports were deformed and damaged after the earthquake, they affected the docks only very slightly. The earth-guard structure of the plate pile which had slanted prop piles hinged to the cap beam was basically undamaged. Slanted prop piles with embedded links bent and split open after the earthquake.

(V) The degree of earthquake damage to all docks with an overly large load during the earthquake was greater after the earthquake, and [damage to] docks that had not been repaired for a long time, or docks with poor engineering quality, was also worse.

(VI) The distance of distribution of the fork piles of pile-elevated docks at river harbors directly affected the earthquake damage to the docks. Large in-between distances produced serious earthquake damage. For details, see Table 2.

Table 2. Distance Between Fork Piles of Pile-Elevated Docks at River Harbors, and the Degree of Earthquake Damage

Name of dock	Average distance between fork piles (m)	Degree of damage
Yujiabao foreign trade dock	11.3	Severely damaged
Xinhe export dock	10	Severely damaged
Cold-storage dock	7.1	Severely damaged
Tanggu No 8 dock	4.4	Medium damage
Tanggu No 9 dock	2	Basically intact

Several Actual Cases of Earthquake Damage

(I) After the pile-elevated docks at seaports were affected by the earthquake, earthquake damage was mostly concentrated in the damage to the fork pile structures. For example, of the 32 pairs of fork-pile structures of the No 9 berth of Xingang harbor at Tianjin (the section of the dock structure is shown in Figure 1), only two pairs remained intact. The pile caps of a few straight piles under the rear-supported platform split under the pressure of the overload on the dock. Earthquake damage to the earth-guard structure is shown in Photo 7 [not reproduced]. Although the slopes of the banks under the docks deformed, there was no slippage. The width of the structural seams between the front- and rear-supported platforms changed. The docks did not undergo whole structural deformation.

(II) After the pile-elevated docks of river harbors were affected by the earthquake, the slopes of the banks slipped and caused the whole dock to deform or to topple and caused serious damage. For example, 51 meters of the dock of the Yujiabao foreign trade dock toppled after the earthquake. The remaining 51 meters became slanted and could not be used. Also for example, the Xinhe export dock had a pile-elevated, beamless structure (i.e., consisting of the pile bases and the upper structure of the surface board). The upstream and downstream banks of the dock had a protective slope of mortar rock masonry. A 1.3-meter-high earth-guard wall was built on the loose rock ridge in the rear of the dock. During the earthquake, four freight barges were docked (the side of the barge against the dock). There was no cargo on the dock. The foundation of that dock at a depth of -4 meters was a subsandy layer, and there was a silt layer at a depth of -7 meters, both belonging to liquefied soil layers. After the earthquake, surging water and sand occurred at more than 200 places on land. Over 10 cracks along the strike of the bank occurred within 20 meters from the rear of the dock; the widest crack was 50 centimeters and reached 1.4 meters deep. The distance of slippage of the dock's upstream and downstream protective slopes toward the center of the river was greater than that of the dock by 1.0 to 1.2 meters. There were longitudinal cracks; lateral arches formed by crushing appeared wavelike; and sliding slopes occurred over a large area. The earth-guard walls in the rear of the docks generally settled 40 centimeters. The surface boards were split apart by the upward push of the fork-pile structures, and some parts showed radial cracks. The pile caps of fork piles were broken off by shearing. The pile caps of straight piles and surface boards came apart, and the piles bent and deformed. Because slippage and displacement at each point of the dock were not the same, the planar sections of the dock staggered 55 centimeters. The structural seam of the front edge of the dock was pushed tightly together, and the seam of the rear edge widened by 9 centimeters. After the earthquake, the plane of the downstream section of the dock showed twisting in a clockwise direction.

IV. Brief Conclusion

(I) Earthquake damage to the pile-elevated docks in the Tianjin area was caused mainly by structural inertia brought about by the earthquake and by the pushing force of deformation (or slippage) of the slopes of the banks. Damage occurred mostly to the fork piles and to the earth-guard structures connected to the banks. Earthquake damage to the elevated piles at seaports was concentrated at the fork-pile structures.

(II) Slippage, displacement, and loss of stability of the slopes of the banks of the docks of the river harbors in the Tianjin area made the earthquake damage of the docks worse and caused the docks to topple or become slanted. Because longitudinal and lateral rigidity was not equal along the entire body of the docks, planar deformation of the docks after the earthquake showed a clockwise twisting. Deformation due to earthquake damage of the pile-elevated docks at river harbors was visible. The earthquake damage was more serious than that to the pile-elevated docks at seaports.

(III) Fork-pile structures were shown to be the major earthquake-resistant component. There was more damage, and the degree of earthquake damage to straight piles (except for damage caused by damage to the earth-guard structures) was correspondingly smaller.

(IV) At present, investigations have been conducted only into the conditions of the upper part of the piles and the pile caps due to earthquake damage to the fork-pile structures. The piles were prestressed-concrete components, but because they were manufactured by the prestretching process, the prestress value at the ends of the piles was very low; the pile caps were ordinary reinforced-concrete components. The strength of both was weak, and this was another reason why they were damaged first.

9296
CSO: 4008/43

NEW ADVANCES MADE IN T CELL RESEARCH

Beijing GUANGMING RIBAO in Chinese 3 Feb 83 p 4

[Text] Zhang Zequan [1728 3419 5425] the correspondent in Canberra reports: Chen Weifeng [7115 1983 1496], lecturer of Department of Basic Medicine, Beijing College of Medicine, had come as a visiting scholar at the Walter Ailizha [phonetic] Hall Medical Research Institute, Australia to work on a Ph.D. in Medical Immunology in June 1980. After 2 years of diligent research, he has obtained important results with respect to the maturation and development process of T cell function in the thymus.

The weakening of T cell function is related to the occurrence of and exacerbated by tumor, autoimmune, and many types of infectious diseases, and a study of maturation of T cell function is, therefore, very significant in the search for reinforcing disease resistance.

His research results fall mainly in the following four aspects: (1) An extracorporal culture method of individual T cell is established and developed to cause the mature T cell colonization effect to reach almost 100 percent. That is to say, every T cell can grow and multiply extracorporally to become a cell colony and there are, on the average, 60,000 cells in each colony. Only when the colonization effect is high can the development process of T cell function and the intercellular regulation be understood. His results in this respect are the best in the world. (2) The T cell subcolony within the thymus and that which has just spread from the thymus and the degree of functional maturation are analyzed to prove that the thymus marrow is the chief site of T cell functional maturation. It has also been discovered that the function of the T cell that has just spread from the thymus has basically reached the fundamental level of the surrounding T cells. A perspective concerning the maturation process of T cell in the thymus is proposed. (3) It has been discovered that after prolonged extracorporal culture the monochromatic [?] T cell with specific antingen reaction can become a T cell of multiple-antigen reaction, before becoming dead. (4) It has been discovered that in order to kill or wound the differentiation maturation of T cell function, the T cell differentiation faction (TCDF) is needed and it is not the two factors of T cell growth factor (TCGF) and T cell differentiation factor.

Chen Weifeng graduated from Beijing College of Medicine in 1958 and has engaged in the work of basic medical education for a long time. When he went to Australia in 1980, he was nearly 45 years of age. At that time the research institute [?] had not arranged a research subject for him. He knew that although hard work was necessary to earn a Ph.D. he also must have a clear and defined research subject if he was to obtain relatively high level research results. Expectations of the fatherland and the people have provided him with the motives to work with perseverance and diligence and he has completed his Ph.D. dissertation in 2 years; normally this requires 3 to 4 years. Some of his papers have attracted the attention of scientists of the United States, the USSR, Japan, England, France, W. Germany, E. Germany, Hungary, etc., and scientists of 15 countries have written to ask him for related data. His foreign colleagues called him "the hardest working person in the research institute." His adviser, Prof Ken Xiaoteman [transliteration] praised him "for doing very outstanding work." The director of the institute, Nuosaer [transliteration] said: "I hope China will continue to send people like Chen Weifeng over here." Chen Weifeng has won honor for the fatherland with his own hard work and excellent achievements.

6241
CSO: 4008/53

CONTRACTING BRIGADE PUBLIC HEALTH AGENCIES TO BAREFOOT DOCTORS SUGGESTED

Methods, Merits

Beijing JIANKANG BAO in Chinese 6 Jan 83 p 1

[Article by Political Research Office, Administrative Division, Ministry of Public Health]

[Text] Most recently, the authors went to the four counties of Zhengding, Xhenxuan, Chicheng, and Huailai of Hebei Province to make a survey of the current condition of brigade public health agencies in the rural villages. It was discovered that with the gradual implementation of the agricultural production responsibility system in recent years, the management of basic level medicine has also broken out of the old mold. Many styles have surfaced to create an unprecedently active circumstance. The current forms of medicine management may generally be summed up as four types: (1) The type operated by the brigades which continues to practice cooperative medical care; (2) The type operated by the brigade but paid for by whoever receives medical treatment; (3) The type contracted by barefoot doctors collectively or individually; (4) The type operated jointly or by individual barefoot doctors. With respect to production, the contract responsibility system is mainly the case in Shenxuan, Chicheng, and Huailai and the number of brigades practicing the cooperative medical treatment system has obviously decreased. Contracting medical treatment to barefoot doctors as a collective body or as individuals has become the major system.

Barefoot doctor contract has become the chief system for medicine management at present. The most important reason [for the emergence of this system] is the fact that after the implementation of the contract responsibility system, work points have been eliminated and the brigade can no longer resolve the problem of remuneration for barefoot doctors; as a result the public health center is contracted out to barefoot doctors who live off their own income. This method is fitting for the current economic foundation of the rural villages.

I. Merits of Contracting Brigade Public Health Agencies to Barefoot Doctors:

There are generally [signed] agreements when brigade public health agencies are contracted out to barefoot doctors and the contents of the agreements include: (1) Drugs and instruments remain the property of the brigade with their cost

and values guaranteed [by the barefoot doctors (?)]; (2) Barefoot doctors take over the jobs of medical treatment, preventive medicine, health care of women and children, and family planning; (3) Barefoot doctors' rewards come from their income. Whoever does a better job has more income.

Cadres, commune members, and barefoot doctors have all said that this is a good system. First, it overcomes the equalitarianism in distribution and is truly a method of reward according to labor; i.e. the more work the more pay, resolving relatively thoroughly, the problem of eating out of a common pot. Second, the service attitude of barefoot doctors is better. They pay attention when they see patients and they always come when the masses ask for them so that being treated for illness is easier. All acclaimed that: "The legs of barefoot doctors move fast now?" Third, the problem of personnel arrangement may be resolved better now, and barefoot doctors are becoming a skilled profession and this situation is stabilizing everyday. The long-standing problem of "one part cadre two-part doctor" is finally being resolved. Four, barefoot doctors are more devoted to their profession and more of them are buying reference books and ordering newspapers and publications. During the survey, the authors also listened to the masses as they discussed some worrisome problems. The first is the question of whether or not there will be instances of demanding a high fee, selling counterfeit drugs, and entraping the masses. The masses said: (1) Barefoot doctors are trained by the party and the people and have a definite awareness of socialism and the idea of service for the people; (2) All drugs now are clearly labeled as to official prices. It is not that easy for anyone to deceive the masses; (3) Barefoot doctors and the patients are residents of the same village. Deceiving the masses would be the same as destroying one's own reputation; this is not a thing a decent barefoot doctor would do. Of course, management should be strengthened to prevent counterfeit drugs and high prices.

Second, there is the fear that disease prevention and health care work will be nobody's job. Results of the survey show otherwise. The quality of disease-prevention and health care work is determined by whether or not the leaders are doing their job according to the policy. Barefoot doctors said that most of them are willing to perform preventive inoculations so long as payment is made according to regulations. Last year, the rate of completion for the measles vaccination and poliomyelitis sugar cube inocalation reached 98.57 percent.

Of course, the duration of the practice of contract responsibility system is still short and there is still a need for it to be slowly perfected. Such problems as the type of contract system most favorable for the stabilization and development of brigade public health agencies, the type of economic aid and support to be provided by the brigade, and the type of management to be given by the departments of public health, etc., are all in need of gradual resolution through summarization of practical experiences. It should be specially pointed out here that a strengthened management should be separated from measures to bind and hamper. Brigade public health agencies are not government organizations and cannot be handled entirely [by the government]. The masses should be left to manage them by themselves. The form of medicine management should be chosen by the masses of each brigade. There should not be "one rule for all" again.

II. Improving the Ability of Barefoot Doctors To Make a Living for Themselves

After the contract system is practiced by a brigade public health agency, the ability of barefoot doctors to make a living for themselves is extremely necessary. At present, aside from some brigades of a larger population and some technically very skilled barefoot doctors who can make a living from the income of their own business, the barefoot doctors of the majority of brigades find it difficult to make a living from their business income alone. In order to guarantee that their income does not decrease, the barefoot doctors of the four counties generally contract some fields. Some contract grain ration fields and others contract labor fields (in other provinces, barefoot doctors may not contract fields or may contract grain ration fields only; the condition varies according to the actual condition of the locality--editor). On the condition that it does not affect their work of medical treatment, disease prevention, and health care, they allocate some time to participate in labor. This is an important problem involving the economic benefits to barefoot doctors and has a great effect on the consolidation of this team [of doctors] and the good performance of basic level public health work. Just as some barefoot doctors say: "although we work a little harder, we should be willing to."

III. The State Cannot Contract It but Should Provide the Necessary Support

Judging from the actual condition at the basic level, after the contract system is practiced, the state should continue to provide brigade public health agencies the support they need. The special fund, allocated each year from the public health expenditure [budget] of every locality for supporting rural basic level public health agencies and the barefoot doctor subsidy derived from the local treasury are all useful for the development and stabilization of brigade public health agencies, but the method of providing aid should be reformed. There should be an award for diligence and a penalty for laziness to develop the enterprise.

After the contract system is implemented, there are mainly three aspects where the support of the state is needed to aid rural basic level public health work. First, based upon the condition of job completion, brigade public health agencies that take on disease prevention, health protection, and family planning work should be given reasonable subsidies and a suitable expense for labor should be charged for planned inoculations. Second, barefoot doctor training expenditures should be increased and the method of training changed. As much as possible, the training classes should be organized during the agricultural slack season and a living allowance should be provided during the training period. Third, if economic hardship makes it impossible for the brigade to raise money to buy drugs, instruments, etc., suitable assistance should be given.

Beijing Commentary

Beijing JIANKANG BAO in Chinese 6 J n 83 p 1

[Text] The article "Brigade Public Health Agencies May be Contracted to Barefoot Doctors" published here demonstrates the fact that in Shenxuan, Chicheng, Hailai, etc., of Hebei, collective of individual barefoot doctor contracts have become the major form of medicine management in the brigades. This form has also been adopted by many other places in the country.

Judging from the condition in these counties, contracting brigade public health agencies to barefoot doctors is a very good system. First, barefoot doctor contract is a responsibility system of managing basic level medicine. The contract agreement stipulates that the public health agency contracted by the barefoot doctor(s) performs the jobs of medical treatment, disease prevention, health care for women and children, and family planning. The sense of responsibility of the barefoot doctors in performing these items of public health work is thus strengthened and the development of these programs promoted. This is a better way of making a direct link between satisfactory performance of local level public health work and the economic benefits of the barefoot doctors. One system produces many gains. Egalitarianism in distribution is thus overcome and the problem of eating out of a common pot resolved to further generate positiveness in barefoot doctors. Third, the material benefit gives impetus to the barefoot doctors to improve their attitude of service, to learn their profession diligently, and to raise the level of medical technology so that the farming masses may receive better medical attention. Fourth, as the income of barefoot doctors increases their livelihood becomes secure and they can be more at ease in performing their work and these basic level public health teams of rural villages will be stabilized. Fifth, in some places, barefoot doctors may invest in a public health center. It is also regulated that a public fund of accumulation should be taken from the business income so that the public health center may continue to grow and develop. These merits are the lifeline of this form of barefoot doctor contract management of medicine and also the promising future of well managed rural basic level public health agencies.

The reason it is possible for this barefoot doctor contract system of managing medicine to be gradually practiced in many localities of the country is mainly because it is a form suitable for the new situation after the joint production responsibility system has been extensively implemented in rural villages. This is a system in harmony with the will of the agrarian masses. We hope the public health departments of all localities will study these experiences of Chicheng County, etc., and break out of the old mold. Based upon the reality and the willingness of the masses of each locality, the rural brigade public health agencies may be readjusted and reformed for better health care for farmers to contribute to the magnificent goal of doubling productivity over and over.

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CSO: 4008/53

BRIEFS

CORONARY ARTERY RECONSTRUCTION--Shanghai Municipal Chest Hospital succeeded in performing a coronary artery reconstructive surgery to reseore the health of patients with severe coronary diseases for whom drugs had been ineffective. Through surgery, physicians placed a new blood vessel bridge to link with the unobstructed coronary artery of the patient so that the heart may again receive a sufficient blood supply. Since 1980, under the leadership of the director of the Department of Chest Surgery, Pan Zhi [3382 3112], that hospital has performed the coronary artery "bridging" surgery for nine cases. [Text] [Beijing RENMIN RIBAO in Chinese 27 Jan 83 p 1] 6248

CSO: 4008/53

AUTHOR: CHEN Baoxi [7115 0202 6007]

ORG: None

TITLE: "National Excavator Industry Conference Held in Beijing"

SOURCE: Beijing JIANZHU JIXIE [CONSTRUCTION MACHINERY] in Chinese No 1, 28 Jan 83 p 23

ABSTRACT: The 1982 National Excavator Industry Conference was held in Beijing Construction Machinery Company on 10-16 Oct. Participants included 48 invited delegates representing 13 units of the excavator industry and other related colleges and research institutes. Leaders of the Bureau of Machinery Ministry of Construction came and delivered speeches. The delegate of Guiyang Mining Machinery Plant communicated to the other delegates the spirit of the 4th meeting of directors of construction machinery industry called by Ministry of Construction in the middle of Aug this year and related documents. Tianjin Research Institute of Construction Machinery proposed revisions to the "Regulation for quality classification of hydraulic excavators" which contains new standards of reliability, useful life, degree of contamination of hydraulic oil, noise, etc. Prof CAO Shanhua [2580 6365 5478] of Tongji University and Associate Prof. HONG Changyin [3163 2490 6892] of Chungqing College of Construction Engineering reported on the general condition and development of construction machinery in W. Germany and backhoe attachment for hydraulic excavators and analytic diagram of properties of excavators respectively. Industry activities for 1983 were discussed. New products scheduled to be studied and developed next year were clarified. Various activities will be launched to promote still closer links among production plants, research institutes, and colleges and to concentrate on improving product quality.

AUTHOR: None

ORG: None

TITLE: "Hydraulic Crane Certification Conference Held in Beijing"

SOURCE: Beijing JIANZHU JIXIE [CONSTRUCTION MACHINERY] in Chinese No 1, 28 Jan 83 p 36

ABSTRACT: A certification conference to examine the 3YT5B and 3YT3B movable hydraulic cranes, designed and made by Beijing Municipal Machinery and Construction Company and Beijing Municipal Machinery and Construction Company Repair and Assembly Plant was held on 22-25 Oct in Beijing. Beijing Municipal Bureau of Construction Engineering was entrusted by the Bureau of Machine Management of Ministry of City and Countryside Construction Environment Protection to take charge of this meeting. The delegates listened to the reports concerning the product designs, experimental manufacture, and industrial tests and inspected the major technical properties and the quality of the prototypes after operation. They also observed the movements and performance of the cranes and related processing equipment. They believed that both products have met the design requirements and approved them for production.

6248
CSO: 4009/102

AUTHOR: None

ORG: None

TITLE: "CLM-1 Roof Bolt and CLQ-1 Dissecting Pit Rock Drilling Machines Certification Conference"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 1, 83 p 61

ABSTRACT: On 17-19 Nov 82, Ministry of Metallurgy and Hebei Provincial Bureau of Machinery jointly called a conference at Fushan Iron Mine of She County, Hebei Province to certify the CLM-1 roof bolt rock drill and the DLQ-1 [?] dissecting pit quarrying machine. These 2 machines are the products of joint research of Beijing General Academy of Mining and Metallurgy, Hebei Xunhua Pneumatic Machinery Plant, and Fushan Iron Mine. The conference believed that the parameter selection for the 2 machines is reasonable, the experimentation is sufficiently extensive, the parts are high interchangeable, the operation is convenient, and the maintenance and repair are simple. The DLQ-1 dissecting pit quarrying machine can satisfy the requirement of forming the pit in one blast. The DLM [?] -1 roof bolt rock drill has the efficiency of making 43-50 roof bolt holes, at a rock hardness of f = 8-12, in one shift. The 2 machines were judged to be advanced. The conference suggested that they should be produced, extended, and used.

AUTHOR: GUO Zhanshan [6751 0594 1472]

ORG: None

TITLE: "The ZL10 Loader Prototype Passed Cerfitification"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 1, 83 p 61

ABSTRACT: The ZL10 loader was designed by Tianjin Research Institute of Construction Machinery and its prototype was manufactured by Tianjin Municipal Construction Machinery Plant. The prototype was test-operated for 1,000 km and undergone 1,000 hr of industrial test operations to verify its properties and capacities. On 10-13 Nov 82, the Tianjin Municipal Construction Committee called a technical certification conference. The conference concluded that the major property parameter of the prototype machine has reached the design requirements. The quality of manufacturing this machine is trustworthy. It was approved for production in batches.

6248
CSO: 4009/106

AUTHOR: DIAN Tong [7193 6639]

ORG: None

TITLE: "China's First Static State Electron Diffraction Instrument"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 1, 83 p 14

ABSTRACT: The DF-1 static state electron diffraction instrument is composed of a STGJ electron diffraction tube and the power source. The diffraction tube measures 50 cm in length, with an electron gun on one end and a 13 cm diameter fluorescent screen on the other. In the middle, there is a polymorphic gold film target and electron beam controlled by 2 pairs static electricity deflection systems. When the tunable voltage (13,000 v) is accelerated, the beam will hit the target to produce the diffraction phenomenon. The X,Y effective deflection radius of the diffraction instrument is 2 cm, with an experimental precision of ± 5 percent. The instrument can directly demonstrate the undulation characteristic of electrons, determine the wavelength of moving electrons, the Planck constant, the lattice constant of the target film metal, the corresponding Miller indices of the diffraction ring. The success in producing this instrument has provided an effective tool for research and teaching of nuclear physics, solid physics, and quantum mechanics in China. The manufacturer of this instrument is not named.

AUTHOR: MA Yunjie [7456 0061 2638]

ORG: None

TITLE: "New Type Microscopic Television"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 1, 83 p 14

ABSTRACT: The 4G9-A microscopic television suitable for the use of medical treatment departments has been produced by Shanghai Radio Plant No 4. This is a closed circuit television system. It has one or two receivers of 12 cun and 14 cun sizes, a camera, and a microscope, with its own impedance transformer. Its standard illumination is 250 lux but the camera can operate normally under 50-15,000 lux. The tramsmission distance may reach 500 m. The ordinary television receiver may be used without modification. This instrument makes it possible for many persons to observe through the microscope simultaneously. After amplification, the slide is displayed on the television screen in a much higher degree of clarity.

6248
CSO: 4009/101

AUTHOR: None

ORG: None

TITLE: "Continuous Casting Technological Conference"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 12, Dec 82 pp 75-76

ABSTRACT: The Continuous Casting Technological Conference, sponsored by Ministry of Metallurgical Industry and China Society of Metals, was held on 30 Aug - 4 Sep 82 in Kunming and 207 delegates participated representing 91 steel and iron enterprises, schools of higher education, equipment manufacturers, leadership departments, and institutes of scientific research and designing. The aim of the conference was mainly to organize for the development of continuous casting in China. A total of 69 essays and reports were received, dealing with such subjects as work process and quality, equipment, horizontal continuous casting, new machinery, etc. Kunming Iron and Steel Company introduced its experience in building and using the small billet continuous casting machine. The delegates observed the production of 70 billets and regarded the machine to be a success. Opinions were solicited concerning the document, "Key Research Plan of Continuous Casting during the 6th 5-year Plan (Draft)," and its 5 key subjects of slab, billet, stainless steel, alloy steel, and horizontal continuous casting were concretely discussed one by one. During the conference time, the Continuous Casting Committee called its first work meeting to approve its charter, to clarify its characters and tasks, and to pass its 1983-84 activity plan. The editorial team of its future publication LIANZHU TONGXUN [CONTINUOUS CASTING BULLETIN] was organized.

AUTHOR: WU Longhua [0702 7127 5478]

ORG: None

TITLE: "Steel Rolling Technology and Theoretical Research Symposium"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 12, Dec 82 pp 76-77

ABSTRACT: The Steel Rolling Technology and Theoretical Research Symposium, under the auspices of Steel Rolling Technology Committee China Society of Metals, was held on 19-22 Aug 82 in Beijing and attended by 43 delegates representing 29 colleges, research institutes, design academies, etc. Following considerable discussion on problems concerning the application of basic theories, it was concluded that theoretical bases for the structure of rolling machines, design parameters, work process designs, and production control were provided by a scientific system established through absorbing knowledge from plastic mechanics, elastic mechanics, fluid dynamics, metallurgy, metal physics, etc. Poor quality of steel, incomplete product specifications, and serious deficiency of energy resources were determined to be the essential problems. The major goals should; therefore, be reforming rolling techniques, improving the quality of steel, expanding product varieties, reducing energy consumption, and raising economic benefits. Many subjects for future research were proposed.

AUTHOR: None

ORG: None

TITLE: "Sino-German Steel and Iron Technology New Development Symposium Held in Beijing"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 12, Dec 82 p 77

ABSTRACT: The Steel and Iron Technology New Development Symposium, jointly sponsored by China Society of Metals and W. German Steel and Iron Association, was held in Beijing on 27-30 Sep 82, to fulfill partially the iron and steel technological cooperation agreement between the 2 countries, signed in 1979. Participants included 15 W. German and 49 Chinese delegates; 9 W. German and 5 Chinese papers were delivered. Chief Engineer of Ministry of Metallurgical Industry LU Da [7120 6671] and Dr Dirk Springorum spoke for the 2 delegations. Subjects enthusiastically discussed during the symposium included: (1) Blast furnace smelting; (2) Steel rolling techniques including wire rods, small rolling machines, coil box, etc.; (3) Converter process; (4) Continuous casting; (5) Refining outside of the furnace; (6) Electrical furnace, its merits, basic designing principles; (7) Management of steel and iron industry. While in Beijing, the W.German delegates visited the Capital Steel and Iron Company and the Research Academy of Steel and Iron of Ministry of Metallurgy and attended a banquet hosted by LI Dongyan, the Minister of Metallurgical Industry.

AUTHOR: FANG Guangming [2455 0342 2494]

ORG: None

TITLE: "The Second Bearing Steel Conference"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 12, Dec 82 p 78

ABSTRACT: The "China Society of Metals Second Bearing Steel Conference" jointly sponsored by the Special Steel Committee and the Committee of Metal Science and Metal Physics, China Society of Metals, was held in Wuxi on 9-13 Jun 82 and attended by 128 delegates. The conference received 38 papers, of which 11 papers were by invitation. Under the guidance of specialists of the older generation, such subjects as techniques of refining outside of the furnace, application and extension of new work processes and new technologies were enthusiastically discussed. It was agreed that following the efforts of the past few years, in China, bearing steel and bearing products can now basically satisfy the needs of the country and their purity and fatigue life etc. are nearing the advanced level of the world. The most delightful outcome is the fact that a new team of young scientists have emerged. Yet, the delegates also agreed that there remain some shortcomings. Essentially, they include brittleness and excessive foreign matter in the steel, poor distribution, granular size, and morphology of carbides, and poor surface quality, caused mainly by outdated equipment, incomplete work processes, backward work techniques, and the lack of modern means of inspection. The 3rd Bearing Steel Conference was expected to be held toward the end of 1983.

6248
CSO: 4009/1000

AUTHOR: None

ORG: None

TITLE: "Department of Radio Turned China's First High-pressure Hydrogen Excited Raman Scatering Laser Frequency Shift Device"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, Nov 82 p 64

ABSTRACT: The Nonlinear Optics Team of Laser Specialty of Department of Radio studied and made the excited Raman laser in high-pressure hydrogen gas. It has emitted light since 1 Oct 82 and produced Stokes and Anti-Stokes spectrum line photos. The energy and conversion effects have been determined. When high-pressure hydrogen is used as the Raman medium, high power laser of relatively narrow spetrum line within a relatively broad range of frequencies may be obtained. This type of hydrogen Raman laser frequency shift devices have appeared in foreign countries. This is the first such product in China, however. A NJ-J_1 energy meter was used to measure the energy of various stages and a total conversion efficiency greater than 30 percent was calculated, at 20 atm of hydrogen. The research project is being continued in the hope of obtaining a tunable frequency shift device of a practical range of frequencies. Brief descriptions of this preliminary device are included in the paper.

AUTHOR: None

ORG: None

TITLE: "Qinghua University Awarded 11 Prizes at the National Science and Technology Award Conference"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, Nov 82 p 90

ABSTRACT: The National Science and Technology Award Conference, called by the State's Science Committee, was solemnly held in Beijing on 23-24 Oct 82. Qinghua University was awarded the following 11 prizes: **Invention** Awards for (1) AC bias gaseous bridge detector; (2) Dual frequency laser automatic compensating device; (3) Dense grid moiré board [?]; (4) External tuning [tunable outside of the cavity] dual frequency laser device; (5) Slanted hole column board [?]; (6) Holographic light elastic material of 3 dimensional stress analysis and experimental technique; (7) Noncontact electric eddy frequency modulation type displacement vibration measurement meter; (8) Layered type gas source generator; Natural science awards: (9) Basic theoretical research on turbulent flow; (10) General theory of calculus of variations; (11) Effects of the origin of coarse sand in the middle reaches of Huanghe on silt accumulation of the lower reaches of Huanghe. Names of scientists associated with the awards are given but the items are not described.
6248
CSO: 4009/98

AUTHOR: LIANG Baozhong [2733 0202 0022]

ORG: None

TITLE: "The 2TX-320 Cumulative Type Suspended Conveyor Certification Conference"

SOURCE: Beijing QIZHONG YUSHU JIXIE [HOISTS AND CONVEYANCES] in Chinese No 1, 6 Jan 83 p 46

ABSTRACT: The Bureau of Heavy Mining Machinery Ministry of Machine Industry called a certification conference for the 2TX-320 cumulative suspended conveyor in Jun 82 in Shiyan City of Hubei Province. That equipment was jointly designed and made by the Automobile Manfufacture Plant No 2 and the Research Institute of Hoists and Conveying Machines. The prototype experimental line was installed in 1976 and had been operated for more than 600 hours by 1979 when on the basis of the summarized experience, another industrial experimental line, measuring 350 m in length was installed and used in production. By May 82, the line had been used to load 83,612 trucks. The average rate of stable operation of the equipment was found to be 97.5 percent. The conference regarded the design, manufacture, and installation of the 2TX-320 to be successful. Its property parameters were found to reach the original design requirements and to be close to the advanced level of foreign products of the same type. It was approved for production, extension, and application.

Automobile Manufacture Plant

AUTHOR: ZHANG Zhenrong [1728 2182 2837]

ORG: Wuxing Electric Roller Plant

TITLE: "The FD (8063,22KW) Air-cooled Electric Roller Cerfification Conference"

SOURCE: Beijing QIZHONG YUNSHU JIXIE [HOISTS AND CONVEYANCES] in Chinese No 1, 6 Jan 83 p 46

ABSTRACT: Entrusted by Ministry of Machine Industry, Zhejiang Provincial Machine Industry Department called a certification conference for the FD (8063.22KW) air-cooled roller in Sep 82, in Nanxunzhen of Huzhou City where the Wuxing Electric Roller Plant is located. Participants included 49 delegates representing scientific research, manufacturing, and leadership units. The delegates unanimously agreed that the product is of good quality. All of its technical indices meet the design requirements and it has reached the domestic advanced level. It was approved for production in batches.

6248
CSO: 4009/105

AUTHOR: SONG Yejun [1345 2814 6874]

ORG: Reporter of the Journal

TITLE: "Chinese Machine Tool Industry's Capability of Serving the Machine Manufacturing Indstry as Indicated by the Wuhan Machine Tool Products Exhibition"

SOURCE: Beijing JICHUANG [MACHINE TOOL] in Chinese No 1, Jan 83 pp 2-8

ABSTRACT: The 1982 Machine Tool Products Exhibition, sponsored by China Machine Tool Company, opened its doors in Wuhan on 8 Oct-8 Nov 82. This was the largest exhibition of that industry since the liberation. Products on display included 219 metal cutting tools, 58 forging presses, 7 casting machines, 13 woodworking machines, 16 large precision instruments, and 2,000 sets of emery wheels, electrical, and hydraulic accessories, and other attachments. Some of these are equal or close to the advanced products of the world. Some are new products, not previously made in China. Some are new generation products for replacing the outmoded ones. These represent new achievements of the industry's research and production since the 3rd National Congress and reflect the level of its technology. A National Machine Tool Order-taking Conference was held simultaneously with the exhibition. With the samples available at the exhibition for inspection, orders were briskly taken. The number of sales far exceeded the estimate to indicate that following the readjustment, the machine tool industry in China had begun to be picking up again. The paper provides some detailed descriptions of a few numerical control machine tools, high precision machine tools, and machine tools jointly produced by China and foreign countries.

AUTHOR: WANG Po [2769 2613]

ORG: None

TITLE: "A Machine Tool Industry Quality Work Process Conference Held in Wuhan"

SOURCE: Beijing JICHUANG [MACHINE TOOL] in Chinese No 1, Jan 83 p 48

ABSTRACT: A Conference of Machine Tool Industry Quality Work Process, called by the Bureau of Machine Tools of Ministry of Machine Industry, was held in Oct 82 in Wuhan and attended by 324 delegates representing 157 units. The conference succeeded in improving the understanding of the importance of technological progress and advanced equipment. It was agreed that China must catch up with the technological level of the late 70's and early 80's of the industrially developed countries by the year 1990. In order to realize this goal, the following measures were proposed: (1) A regular education program to instill the idea of "quality first and customer first;" (2) Quick adoption of international standards; (3) Developing property and quality inspection of products for issuing production licenses; (4) Eliminating the 7 pollutants; (5) Seriously implementing technological reform; (6) Strengthening scientific research and organizing work process breakthroughs; (7) Extending total quality control; (8) Strengthening technical training of workers.

6168
CSO: 4009/97

AUTHOR: None

ORG: None

TITLE: "Bureau of General Purpose Basic Parts Ministry of Machine Industry Called in Qingdao a Cooperative Conference of Leak Treatment Work of Key Factories of Hydraulic Component Products"

SOURCE: Guangzhou JICHUANG YU YEYA [MACHINE TOOL AND HYDRAULICS] in Chinese No 6, 15 Dec 82 pp 50

ABSTRACT: The conference was held in Qingdao on 5-9 Sep 82 and participated by 62 delegates representing 37 units including Qingdao Municipal Bureau of Machines, Jiangsu Provincial Department of Machinery, Shanghai Machine Assembly Company, Beijing, Tianjin, Liaoning, Jiangsu, Sichuan Hydraulics Companies, Beijing Research Institute of Automation, Guangzhou Research Institute of Machine Tools, Jinan Casting and Forging Institute, Tianjin Research Institute of Engineering Machinery, and other hydraulic parts plant, sealing parts plant, standard parts plant, etc. At the conference, the bureau communicated the spirit of the conference regarding quality. The current condition of the quality of basic parts and the experiences in leak treatment were discussed and exchanged. The documents of "Methods of Inspecting Hydraulic Pumps (hydraulic motors) for Leaks" and "the Technical Conditions of Inspecting these products" were discussed, revised, and passed. Problems concerning granting product licenses and implementing international standards were also discussed. During the conference time, the delegates visited Qingdao Sealer Plant and admired the economic benefits of the technology introduced by the plant from foreign countries.

AUTHOR: None

ORG: None

TITLE: "TYB Cam Rotor Blade Pump Certification Conference"

SOURCE: Guangzhou JICHUANG YU YEYA [MACHINE TOOL AND HYDRAULICS] in Chinese No 6, 15 Dec 82 p 51

ABSTRACT: Guangdong Provincial Department of Machines was entrusted by the Bureau of Machine Tools Ministry of Machine Industry to call the certification conference in Guangzhou Research Institute of Machine Tools on 7-9 Jul to inspect the TYB cam rotor blade pump designed and made jointly by Guangzhou Research Institute of Machine Tools, Fuzhou University, and Wenzhou Work Process and Parts Plant. The conference was attended by 28 delegates representing 13 units. The diagrams, technical documentation, and data were examined in detail and three of the 5 prototype pumps were tested and one of the three was operated for a hypervelocity test. Dongfanghong Shoe Plant of Wenzhou delivered a report of the condition of use of the cam rotor blade pump. The conference approved of the pump as being a medium high pressure hydraulic pump of simple structure, low noise, even flow, high efficiency, and long life. The documentation and diagram were found to meet the State's standard. All three prototypes were found to have exceeded the ministerial standard and were approved for small batch production.

6248
CSO: 4009/99

AUTHOR: WANG Zhenming [3769 7201 7686]
ZHANG Zhixin [1728 1807 2450]

ORG: None

TITLE: "Second National Conference of Compound Materials"

SOURCE: Beijing LIXUE YU SHIJIAN [MECHANICS AND PRACTICE] in Chinese No 1, 83 p 60

ABSTRACT: Under the joint auspices of China Society of Mechanics, China Society of Aviation, and China Society of Space Navigation, the 2nd National Conference of Compound Materials was held in Harbin on 18-22 Aug 82 and attended by 265 delegates. The conference recieved 230 papers. For delivering the papers, the conference was divided into 4 special subject groups: (1) Resin-based compound materials and work process; (2) Board, casing and optimization designing; (3) Fracture and fatigue properties; (4) Metallic compound materials. The first National Conference of Compound Materials was held in 1980. By comparison, the 2nd conference demonstrated an increase of number of persons engaged in the study of the mechanical properties of compound materials, an increase of types of fibrous and compound materials, and the development of modification of solid resin systems and testing instruments. During the conference time, the Compound Materials Mechanics Specialty Group of China Society of Mechanics held a symposium. It was also preliminarily resolved that a small symposium on compound materials mechanics and related subjects will be held toward the end of 1983.

AUTHOR: ZHANG Zhixin [1728 1807 2450]

ORG: None

TITLE: "The National Fatigue Conference"

SOURCE: Beijing LIXUE YU SHIJIAN [MECHANICS AND PRACTICE] in Chinese No 1, 83 p 61

ABSTRACT: The National Fatigue Conference, jointly sponsored by China Society of Aviation and China Society of Mechanics, was held in Huangshan of Anhui Province on 7-12 Sep 82 and attended by 92 delegates representing 42 organization all over the country. A total of 58 papers were delivered, dealing with the estimate of fatigue life, drawing up a load spectrum, principle of extension of fatigue fissures, fatigue statistical analysis, fatigue test methods, conditions of international fatigue research, and the study of micromechanism of fatigue process, etc. Although there have been great strides in fatigue researches in China in recent years, some problems remain, such as an uneven development of various subjects, insufficient development of experimental conditions and equipment and testing techniques, insufficient data of basic properties of fatigue, especially low cycle fatigue, etc. It was resolved that the next fatigue conference will be held in 1984.

AUTHOR: SU Xianji [5685 0341 1015]

ORG: None

TITLE: "Multiple Spark Type Dynamic Photoelastic Instrument"

SOURCE: Beijing LIXUE YU SHIJIAN [MECHNICS AND PRACTICE] in Chinese No 1, 83 p 64

ABSTRACT: China's first multiple spark type dynamic photoelastic instrument, a joint research project of the Department of Mechanics of Beijing University and Beijing Scientific Instrument Plant, was completed toward the end of 1981. Trial applications of half a year proved its property indices to be close to the advanced international level. It is composed of a multiple spark device, an optical device, a globular gap switch, a load device, and control and measurement devices. A schematic diagram and a photo of the instrument are included. When the polarization plate and the 1/4 wave plate are removed, the instrument serves as a high-speed camera for studying high-speed dynamic problems other than photoelasticity. The instrument is currently being test-produced by Beijing Scientific Instrument Plant, awaiting its official certification. The major components and the property indices of the instrument are briefly described.

6248

CSO: 4009/113

AUTHOR: None

ORG: None

TITLE: "The Fifth Expanded Conference of Board of Directors of Heat Treatment Society China Society of Mechanical Engineering"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 1, 83 p inside backcover

ABSTRACT: On 14 Nov 82, the 5th expanded conference of the board of directors of Heat Treatment Society China Society of Mechanical Engineering was held in Lintong of Shaanxi Province and attended by 13 standing members and 21 members of the board. The discussion involved mainly the condition of preparation of the 3rd International Conference of Heat Treatment of Materials to be held in China in 1983. Liaisons with the various specialty committees of the International Heat Treatment of Matarials Joint Conference were preliminarily named. The Secretariat and the Specialty Groups were asked to formulate the 1983 activity plan and it was also resolved that the 6th All-Member Meeting of the Board of Directors will be held in May 83 in Shanghai. From the papers submitted to the 3rd National Conference of Heat Treatment and more recent papers recommended by branch societies, 29 papers were tentatively chosen for the 3rd International Conference to await final decision by the Organization Committee of the Heat Treatment Society China Society of Mechanical Engineering.

AUTHOR: None

ORG: None

TITLE: "The 3rd Annual National Conference of Heat Treatment"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 1, 83 inside backcover

ABSTRACT: The 3rd Annual Conference was held on 15-20 Nov 82 in Lintong, Shaanxi and attended by 150 members of the board, authors of papers, representatives of branch societies, and invited guests. Prof QI Zhengfeng [2058 2973 7364] of Dalian Railway College spoke on effects of the original composition on heat treatment changes of steel; Prof ZHANG Shouhua [4545 1343 5478] of Beijing College of Iron and Steel spoke on the action of rare earth elements in heat treatment of steel; the Research Institute of Machine Tools Ministry of Machine Industry reported on domestic application and development of low temperature chemical heat treatment. The conference was divided into groups to listen to the delivery of 57 papers and to discuss 16 papers. There were also exhibits of heat treatment equipment, instruments, meters, as well as samples and models of products, from which a selection will be made by the Heat Treatment Society for submission to the exhibition of the 3rd International Conference of Heat Treatment of Materials.

6248
CSO: 4009/107

AUTHOR: ZHAO Yang [6392 2799]

ORG: None

TITLE: "Brief News"

SOURCE: Beijing JILIANG JISHU [MEASUREMENT TECHNIQUE] in Chinese No 1, 18 Jan 83 p 63

ABSTRACT: The BR27 high precision standard condenser of Zhuzhou City Metrological Division Experimental Plant of Hunan Province has an effective capacity of 0.1-0.5m^3 (or other capacity required by the user); it is a precision temperature control device of temperatures of $20^{\circ}\pm0.1^{\circ}C$, $20^{\circ}\pm0.3^{\circ}C$, and $20^{\circ}\pm0.5^{\circ}C$. The State's Bureau of Metrology has approved the experimental plant as its special producer. The plant also produces the Q.B.J. meter for length measurement, and other meters and instruments of special uses. These products are in stock and ready to supply to users. The plant will also accept orders of special requirements or special processes.

6248
CSO: 4009/108

AUTHOR: CHEN Yepin [7115 2814 0756]

ORG: None

TITLE: "Sealed Reduction Separator and Gravity Hydrosizer Successfully Made by Liuzhou Geology and Ore Prospecting Machinery Plant"

SOURCE: Luoyang KUANGSHAN JIXIE [MINING MACHINERY] in Chinese No 1, Jan 83 p 66

ABSTRACT: Liuzhou Geology and Ore Prospecting Machinery Plant has succeeded in making the XSM-81 sealed reduction separator and the XSZX-81 gravity hydrosizer. These 2 types of laboratory ore dressing equipment have recently been certified in Changchun. The delegates invited by Bureau of Equipment Industry Ministry of Geology and Mineral Deposits regarded the 2 products to be structurally reasonable and approved them for production. Technicians of the Liuzhou Plant analyzed some domestic and foreign products of the same type, adopted the merits of some and discarded the shortcomings before designing and making the XSM-81 sealed reduction separator. It is suitable for reduction separation of crushed ore samples weighing less than 3.5 kg. The material may be continuously and evenly fed into the machine and after separation, the grade composition will basically be the same as the original sample and the grade error reaches the requirement of the ministry. There is an electromagnetic vibrator in the sealed tray so that residues will fall out. The XSZM-81 gravity hydrosizer was made by the plant in cooperation with Central South Mining and Metallurgy College. It is suitable for analyzing fine grain materials that are not soluble in water. Devices to supply constant-pressure water, to add separating agent, and to stir the material are satisfactorily arranged and the hydraulic classifying result repeats well. The weight difference of repeated tests is less than 1.59 percent and the standard error less than 0.71 percent.

6168
CSO: 4009/111

AUTHOR: YE Changli [0673 7022 4409]

ORG: Correspondent of ZHONGGUO ZHILIANG GUANLI

TITLE: "Extension of Total Quality Control by Bureau of Machines No 5 in Sichuan"

SOURCE: Beijing ZHONGGUO ZHILIANG GUANLI [QUALITY CONTROL IN CHINA] in Chinese No 1, 83 p 13

ABSTRACT: From 4-24 Nov 82, the Inspection and Certification Tea of the Bureau of Machines No 5 of Sichuan Province carried out the first batch of requests for total quality control extension among the Sichuan Weapons Industry Enterprises and preliminary stage certification was given to Changqing Machinery Plant, Hongguang Instrument Plant, Jiangling Machinery Plant, and Changan Machinery Plant. The method of inspection included listening, observing, inquiring, examining, and discussing. After the inspection was completed, it was concluded that a great deal of work had been extended by the 4 enterprises regarding total quality control and very great achievements had been obtained to raise the economic benefits. Finally, based upon the achievement review, the enterprises were classified into 3 first class ones, given a grade of above 90 percent, and one 2nd class enterprise, given a grade of above 80 percent.

AUTHOR: HE Jiagui [0149 1367 2710]

ORG: Correspondent of ZHONGGUO ZHILIANG GUANLI

TITLE: "The 2nd National Product Quality Appraisal and Inspection Conference"

SOURCE: Beijing ZHONGGUO ZHILIANG GUANLI [QUALITY CONTROL IN CHINA] in Chinese No 1, 83 p 36

ABSTRACT: The State's Bureau of Standards called the 2nd National Product Quality Appraisal and Inspection Conference in Hengyang [Hunan Province] on 10-15 Nov 82. A total of 200 persons representing related departments and committees of the State Council, the standardization departments of key industrial cities of 29 provinces, cities, and autonomous regions, and those responsible for product appraisal and inspection attended. The 2 documents, "PRC Product Quality Appraisal and Inspection work Management Regulation (draft)" and the "PRC Product Quality Certification Work Management Rgulation (draft)" were earnestly discussed. For the purpose of creating a new atmosphere in product appraisal and inspection work, 3 requirements were presented to the departments and localities: (1) A national quality appraisal and inspection network with power and authority should be basically established before 1985; (2) A system of surveillance management procedure should be established and perfected; (3) The professional level of the appraisers and inspectors should be raised.

6248
CSO: 4009/103

END